Damage profile of house rat (*Rattus rattus*) on dough and mature stages of maize in a crop habitat of Faisalabad

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Abstract- This study mainly focused on the reduction of damage profiles of house rat (*Rattus rattus)* on dough and mature stages of maize in crop habitat of Faisalabad. House rat is herbivore and entirely feed on the crop plantations, stems and tillers, which directly leads to the production loss, it can also implicated intensive economic losses. Therefore, study was conducted for a period of two months April through May, 2016. Evidently, the three types of traps viz; Steel jar trap, McGill mouse trap and Double capture trap were effectively used against rodent pest. Observation regarding first week of April on dough stage of maize a total of 79, 15, 41 and overall 135 specimens were captured. Seemingly, the dough and mature stages comprised the enough nutrients to attract fairly large numbers of rodents and therefore, attempts should be made to decrease this damage through addition of eco-friendly methods like the traps and also recently trap barrier system to minimize their damage proportions and also improved crop quality and production.

Index Terms- Abundance, Crop protection, Damage profiles, Management, Rattus rattus, Traps

I. INTRODUCTION

Maize (*Zea mays*) is a plant belongs to the family of grasses (Gramineae). Maize is one of the main cereal crops and cultivated globally. It is an important food crop for animal and human food and raw material for manufacturing of many industrial products which include corn syrup, corn oil, corn starch and products of distilleries and recently used in the manufacturing of biofuel [1].

After wheat and rice the maize is the third most important crop among cereals in the world in area and production. In Pakistan, its total production is 3560 thousand tons and grown an area of 1030 thousand hectares. The composition of Maize grain consists of 72% starch, 10% protein, 5.8% fiber and 3.0% sugar [2].

Among vertebrate pests such as rodents are belong to class Order Rodentia and family Muridae are small mammals. Rodents cause severe damage to a variety of crops one of these is maize which damage by both directly and indirectly hoarding and gnawing activities during dough and mature stages of crops. Rodents are capable of rapid population growth can adjust themselves and breeding during crop growing stage and expatriation pre and post harvesting of crops depending upon food accessibility [3]

Rodents are about 1700 species in worldwide but fewer cause problems over larger geographic areas only 5-10% are major pest species. Rodents like house rat consume substantial amounts of agricultural products and farmers thought that rodents are the main barrier to higher yields in many developing countries [4].

At global level Rodents have been recognized as the most significant mammalian agricultural pests [5]. Many rodents comprise the largest part of the entire area used for agriculture in the worldwide widespread in fields of crops like maize. About 77 species are recognized to cause crop damage are several species of rodents and few of them are agricultural pests [6].

Economic losses and food deficiencies in some parts of the world are caused by rodents [7]. Every year during pre and post harvesting period a huge amount of crops is lost [8]. Rodents have ability to live in different environmental conditions and consume an extensive amount of foods is the important capability of rodent pest species [9].

The house rat (*Rattus rattus)* is one of the most common and economically important of the commensally rodents. This rat not only inflicts heavy damage to stored food and dough and mature stages of maize but also have pest value being carrier or vector of disease. It is only an indoor pest in Pakistan. It has wide distribution, high abundance, great dependence on man's food it is probably one of the most important pest in Pakistan [10].

Rats are well adapted to the diversity of agricultural habitats produced by humans. There are 42% mammal species are classified as rodents are animals which have no canine teeth and growing continuously. Rodents also play an important role in nutrient cycling so, the non-pest species need to be protected and less than 10% are significant agricultural pests and rodents are a problem in that way they are the living in almost every habitat on earth [11].

Rodents have three major damages of the crops. The first one is the extensive damage they can cause at any stage like dough and mature stages of the growing crop. The second is the loss of stored grain and vegetables. The third impact is on the health of farmers because rodents cause at least 20 severely devastating human diseases [12].

The house rat is probable for causing damage on variety of vegetation with sufficient moisture and lowers the crop production

among several habitats throughout the world [13]. Diversity of rodents reported among large agriculture also non-cultivated localities bring about large destructions and resulting economic losses [14]. Although the initiation of multiple cropping systems (MCS) has benefitted majority of farmers in South Asian regions but has also resulted in harmful influences' on agriculture like the arrival of large populations of the vertebrate pests like house rat [15].

The community based trap barrier system (CTBS) designed at inhibiting rodent damages-friendly methods through the contribution of farmers. It has been extensively practiced in Australia, Indonesia, Philippines, Vietnam and major parts of China. A significant feature of the trap barrier system (TBS) is that, the protection of crop occurs in suitable manner and the whole crop is covered by poly-ethylene sheets which hold together with wooden bamboos, at adequate height of about (50 cm) from soil [16].

The barrier system is armed with the sufficient water channel containing multiple channels for movements of rats. Presence of inlets mostly towards the four corners of crop localities contains four types of traps like single, double and multiple capture and steel jar having rodent attractive baits of grains, vegetables and fruits to successfully entrap house rats. Ecologically-based rodent management is required for Pakistan to achieve progressive agriculture outputs and diminish economic losses cause by the rodent pest species. To accomplish this type of managements prior knowledge of the rodent species present in both indoor and outdoor habitats is mandatory [17].

II. AIMS AND OBJECTIVE

➢ To determine the damage profile of house rat
➢ To evaluate the efficiency of traps in term of reduction of house rat

III. MATERIALS AND METHODS

This study comprised the observations ton damage profiles of house rat (*Rattus rattus*) dough and mature stages of maize (*Zea mays*) in an irrigated crop plantation. Evidently, the maize happens to be one of the boisterous crops in the country and one of the cash crop which is responsible for meeting the domestic food requirements.

For the present study, the observations were extended separately for the dough and mature stages of maize for a period of about two-month April to May, 2016. First four week in the April were concerned with the continuous observation on the dough stage by the damage pattern of house rat. Incorporation of traps namely steel jar traps, McGill mouse trap and double capture trap. All these traps were baited with suitable feeding material and placed within the maize crop during the dough and mature stage. The traps were examined the following morning to detect the house rat specimens. The other capture rodents were not included in the counts. The relative abundance and distribution pattern of the house rat were assessed on the basis of house rat population.Comparision were also made in the terms of the traps by the three types of the traps. Traps success ratio was determined on the basis of remained the high point index for the rodents.

IV. RESULTS

Observations recorded for the damage patterns of house rat (*R. rattus*) on the dough stage of maize in a forest plantation in Faisalabad. Observations are represented cumulatively per week. Observations were made in evening.

Table 1: **Observations recorded for the damage patterns of house rat (*R. rattus*) on the dough stage of maize 1st week of April 2016**

Week days	Steel jar trap	McGill mouse trap	Double capture trap	Overall
Saturday	17	1	7	25
Sunday	11	2	6	19
Monday	7	2	8	17
Tuesday	12	1	8	21
Wednesday	15	4	4	23
Thursday	10	2	3	15
Friday	7	3	5	15
Total Average	79 11.28	15 2.14	41 5.85	135 7.02

Table 1 showed that a total of 135 house rat were captured which is weekly data during dough stage of Maize. Steel jar trap capture more rodent species as compared to McGill mouse trap which captured only 15 specimens.

Fig. 1 showed comparison made on the effective of traps according to their relative abundance. While, steel jar trap remains highly effective as compared to other two traps.

Fig. 1 Graphical representation of days with efficiency of traps on dough stages of maize.
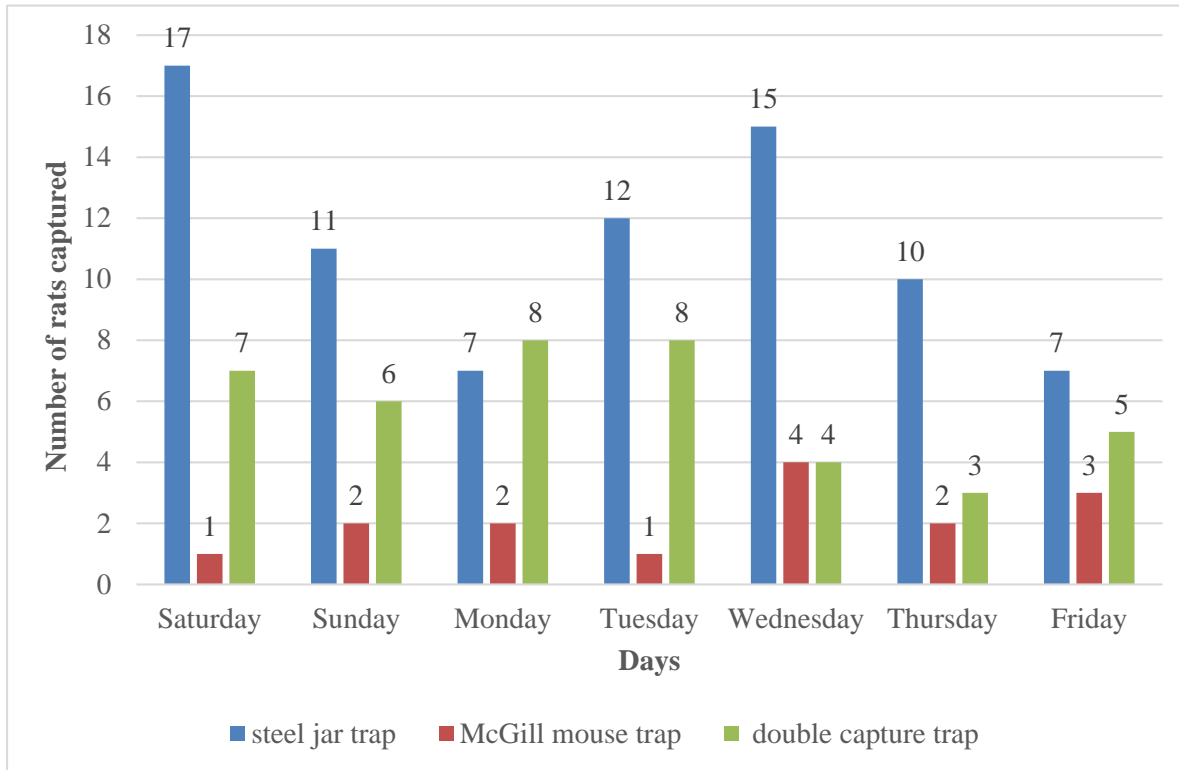
Total Average	90 12.85	29 4.14	41 5.86	160 7.04

Table 2: Observations recorded for the damage patterns of house rat (*R. rattus*) on the mature stage of maize

Week one (May 2016)

Week days	Steel jar trap	McGill mouse trap	Double capture trap	Overall
Saturday	16	6	6	28
Sunday	14	4	7	25
Monday	10	3	6	19
Tuesday	16	3	5	24
Wednesday	12	5	4	21
Thursday	13	3	6	22
Friday	9	5	7	21

Table 2 showed that a total of 160 house rat were captured which is weekly data during mature stage of maize. Steel jar trap capture more rodent species as compared to McGill mouse trap which captured only 29 specimens.

Fig. 2 showed comparison made on the effective of traps according to their relative abundance. While, steel jar trap remain highly effective as compared to other two traps.
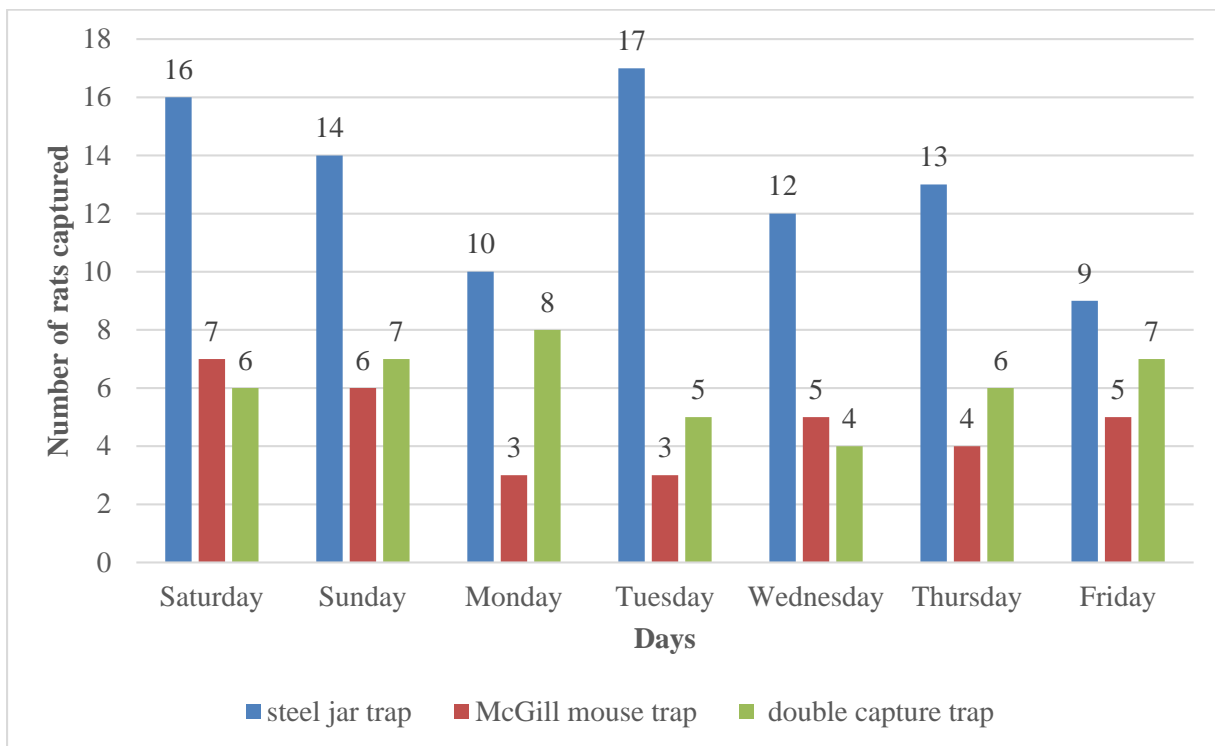
Fig. 2: Graphical representation of days with efficiency of traps o mature stages of maize.

V.   DISCUSSION

Observations recorded for the damage patterns of house rat (*R. rattus*) on the dough stage of maize in a forest plantation in Faisalabad. For the present study the observations were extended separately for the dough and mature stages of maize for a period of about two month April to May, 2016. Observations are represented cumulatively per week. Observations were made in evening. Table 1 showed that a total of 135 house rat were captured which is weekly data during dough stage of Maize. Steel jar trap capture more rodent species as compared to McGill mouse trap which captured only 15 specimens. The overall trap success ratio showed that steel jar traps remain highly effective against the rodent management. Observation regarding the first week of May represent that a total of 160 specimens captured in all three types of traps. In all these steel jar trap captured 90 specimen as compared to double capture trap and McGill mouse trap which capture least number of house rat. The overall average of steel jar trap is 12.85 which show that steel jar remain more effective rodent control while the average of other two traps are 5.86 and 4.14. Undeniably, the house rat is consider on of the serious vertebrate pest through the region of central Punjab, Pakistan and causes substantial damage to the crop habitats which are mainly located closed to the canal irrigation system. Therefore, such activities are proved destructive and lead to economic losses. Therefore, the study has been designed to reduce the damage profile of House rat by incorporation of trap barrier system (TBS). Trap barrier system is an innovative method which can successfully decline the rodent depredations by ecologically management of the recyclable poly-ethylene sheets introduced into the economically important crops; wheat, maize, rice, cotton along with the placement of various traps provided with appropriate baits for effective rodent capture. Rodent profusion was more noticeable during the reproductive stages of the crop which milky and fruiting stages and mature stages. It appeared that as the crops developed toward the reproductive stages, so did the accessibility and quality of food and cover (crop height) which may have been favorable for rodent population growth. Similar increases in rodent richness in the course of increasing vegetation cover and crop development have been reported [18, 19]. It was clearly visualized that number of house rat was fairly reduced due to the fact that there was inhibiting agents. This situation was maintained throughout the length of study period, thereby indicating the effectiveness of the traps for rodent control.

VI.   CONCLUSION

From the present study, it was determined that, unquestionably all rodents remain economically significant vertebrate pests to variety of crops. They caused damage and also accountable for substantial economic losses. The inductions of useful and environmentally safe ecologically based rodent management measures are more reliable and safe control programs. It resulted that ecologically based rodent management is a suitable approach to overcome the population of rodent pest and to improve agro-ecosystem and beneficial for smallholder farming communities.

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