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# Pre and Post Emergence of Maize (*Zea mays*) Versus Rodents; Challenges and the Ways Forward

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## ABSTRACT

**Background and Objective:** Maize farmers are often faced with numerous challenges which are caused by rodents. These attacks by rodents occur both on the field and in the store rooms. The attacks in this study focus on field ones that cause serious losses to farmers, thereby leading to food insecurity. This study was conducted to obtain information about farmers' challenges with rodents and their attacks on maize plants in Benin City. **Materials and Methods:** The instrument for data collection was a structured questionnaire. The instrument was validated by three experts and a reliability test was carried out using Cronbach Alpha which yielded a coefficient of 0.84. The instruments were administered to the respondents made up of farmers (n = 190) and extension workers (n = 20) from the Benin Metropolis were randomly selected and used as respondents and the data collected were analyzed using statistical mean and standard deviation. **Results:** The findings of the study revealed some of the challenges faced by maize farmers which include: Causing damage to seeds and seedlings, picking up seeds from the soils immediately after sowing, uprooting seedlings and eating up the cotyledons, destruction of the embryo of maize seeds and eating up of maize seedlings once they shoot out among others. The findings of the study also showed some of the ways farmers can combat the problem of rodents to have maximum yield. The solutions identified by the study include: Spraying seedlings with rodenticides, soaking maize seeds in chemicals before planting, early planting, crop rotation, use of scarecrows at different locations and with different colors, setting traps and use of poison bait amongst others. **Conclusion:** The study concluded that farmers should seek consultations from experts on effective rodent management strategies for maize at both pre and post emergence stages.

## KEYWORDS

Maize, rodents, maize seedlings, maize plants, field and farmers



## INTRODUCTION

Maize is regarded as a cereal crop and is of great importance among grain crops in most of the tropics and sub-tropics, especially in Africa and South America. Sprague in Msuya and Stefano[1] described it as one of the most important food crops. This was corroborated by Brewbaker[2] by stating that maize is one

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of the three most explored food crops by mankind, owning to the high value derived from it. Maize which is also called corn belongs to the grass family called Poaceae[3]. It is one of the most widely cultivated cereal crops in almost all agricultural ecological zones after wheat and rice[4]. According to Sprague in Msuya and Stefano[1], maize has been recognized as one of the most important crops that is used by man as food, feedstuff for livestock and industrial purposes in most parts of the world. Due to its significant yield potential, Msuya and Stefano[1] described it as the "Queen of Cereals". Maize as a crop plant is cultivated throughout the year in almost all parts of the world. In addition to its usefulness as food for both man and livestock, it also serves as a quality ingredient in thousands of industrial products such as starch, oil, protein, alcoholic beverages, sweeteners, pharmaceuticals, cosmetics, plastics, fabrics, gum, package and paper industries amongst others[1]. The authors highlighted the chemical characteristics of maize to include crude fiber (5.04-6.54%), crude protein (8.06-9.86%), carbohydrate (963.68-68.05%), fat (6.75-7.05%) and ash (91.85%). Maize can be consumed by boiling and roasting and can be used for pap as well as swallow.

Rodents are creatures that cause damage to crop plants through the consumption of crop parts such as seeds, leaves as well as stems and fruits. They have been reported to cause serious problems to humans in Africa due to their involvement in the spread of diseases in crop farms as well as losses of crops through direct consumption and spoilage[5,6]. As far back as in the sixties, Taylor[7] reported 20% damages done to maize crops due to an outbreak of rodents in Western Kenya. Taylor[7] on economic losses caused by rodents in Kenya was reported to be 20-30% damage to maize crops after cultivation. In corroboration, Bekele *et al*.[6] reported rodent damage to maize crops in Ethiopia to be 26.4% of the total crops grown in a particular year. In Tanzania, rodents were reported to cause a 15% yield loss in maize cultivation[8], which amounted to a loss of about 382673 tons per year of the actual yield[9]. However, in some parts of Africa, damages done to maize crops are quite higher than those reported in Tanzania and Ethiopia[10].

Ways to control or eliminate rodents from gaining access to crops on the farm both at pre and post-emergence periods become an important aspect of farming that farmers must give attention to. Desoky[11] stated some ways to eliminate rodents which include the use of traps, poison bait, use of predators to feed on rodents, cleanliness on the farm, use of sound and use of glue boards as well as closure of rodent burrows on the farm. Maize farming requires little effort and capital to start up and these make it an appropriate and profitable enterprise for crop farmers. Maize is a popular staple food consumed in Benin City by almost everyone during its production season. Maize seems to be scarce and quite expensive in Benin City even during its production season. Maize farmers have attributed the scarcity and high cost of the product to some farming and cultural challenges, especially those being faced during the pre and post-emergence of the crop plants. This situation according to maize farmers and those who buy directly from the farm has made maize to be very expensive to buy. In order to proffer solutions to the problem of scarcity and high cost of maize, this study was initiated to find out the challenges being faced by maize farmers at both the pre and post-emergence periods of the crop plants. Hence, the study is conducted to identify the challenges of pre and post-emergence of maize and rodents in Benin City and the ways forward. This study conducted to identify the challenges of pre and post-emergence of maize and rodents in Benin City and the ways forward. Specifically, the study sought to: Identify pre and post-emergence challenges of maize crops caused by rodents in Benin City, ways forward of rodents and their damages to maize at pre and post-emergence periods in Benin City.

## MATERIALS AND METHODS

**Study area:** The design of the study was a descriptive research design. The study was carried out in Benin City which comprises three Local Government councils which are Oredo Local Government Area, Egor Local Government Area and Ikpoba Okha Local Government Area with their headquarters at Benin City, Uselu and Idogbo, respectively. The study was carried out between April and August, 2022.

**Study design and methodology:** A simple random sampling technique was used to obtain a sample size of 210 respondents consisting of 190 maize farmers and 20 agricultural extension officers. The farmers were randomly selected from the three local government areas in Benin City while the extension officers were obtained from the State Ministry of Agriculture which has its headquarters in Benin City. The instrument for the collection of data was a structured questionnaire titled "Maize versus Rodents Questionnaire (MVRQ)". The questionnaire had three sections which are A, B and C with four-point scales of Strongly Disagree (SD), Disagree (D), Agree (A) and Strongly Agree (SA) with corresponding values of 1, 2, 3 and 4, respectively. The instrument was validated by three experts from Faculty of Agriculture, University of Benin, Benin City. The reliability index of 0.84 was obtained using the Cronbach Alpha method to determine the internal consistency of the questionnaire. Two hundred and ten copies of the instrument were administered to the respondents by the researchers. The researchers retrieved the questionnaire immediately after the administration.

**Statistical analysis:** Data collected were statistically analyzed using mean and standard deviation to answer the research questions at 0.05 level of significance. In making a decision, any item whose mean value was 2.50 or above an average on a 4-point scale was considered as agreed while any item whose mean value was below 2.50 was considered as disagreed. The researchers made use of Statistical Package for the Social Science (SPSS) version 23 for the analysis.

## RESULTS

The results of the descriptive analysis are presented in Table 1-2.

Table 1: Mean ratings of respondents on the pre and post-emergence challenges of maize crops caused by rodents in Benin City (n = 210)

| S/N | Pre and post-emergence of maize challenges | X | SD | Decision |
|---|---|---|---|---|
| 1 | Rodents are dangerous and cause damage to maize seeds and seedlings | 2.95 | 0.88 | Agreed |
| 2 | Rodents usually pick up maize seeds from the soil immediately after sowing | 2.92 | 0.27 | Agreed |
| 3 | Rodents uproot maize seedlings and eat up the cotyledon | 2.70 | 0.46 | Agreed |
| 4 | Some rodents destroy the embryo of maize seeds | 3.17 | 0.37 | Agreed |
| 5 | Some rodents eat up maize seedlings once they shoot out | 2.86 | 0.35 | Agreed |
| 6 | Rodents' activities increase farmers' labor | 3.12 | 0.77 | Agreed |
| 7 | Rodents' activities increase farmers' cost of production | 3.39 | 0.72 | Agreed |
| 8 | Rodent reduce crop yield of farmers | 3.04 | 0.91 | Agreed |
| 9 | Rodents reduce farmers' income | 3.39 | 0.72 | Agreed |
| 10 | Rodents reduce the quality of farmers' crops | 3.77 | 0.77 | Agreed |

X: Mean, SD: Standard deviation and N: Number of respondents

Table 2: Mean ratings of the ways forward of rodents and their damages to maize at pre and post-emergence periods in Benin City (n = 210)

| S/N | Ways forward of rodents and damages to maize | X | SD | Decision |
|---|---|---|---|---|
| 1 | Spraying seedlings with rodenticides will help to destroy rodents on the farm | 3.13 | 0.63 | Agreed |
| 2 | Soaking maize seeds in chemicals before planting will help to scare rodents away | 2.60 | 0.85 | Agreed |
| 3 | Practicing early planting | 2.77 | 0.72 | Agreed |
| 4 | Crop rotation will help to chase some rodents away | 3.30 | 0.70 | Agreed |
| 5 | Use of pest-resistant varieties of maize will help | 2.44 | 0.96 | Disagreed |
| 6 | Use of scarecrow in different locations on the farm with different colors will be helpful | 2.92 | 0.88 | Agreed |
| 7 | Setting traps for rodents will help | 3.50 | 0.50 | Agreed |
| 8 | Use of poison baits for rodents will help to scare some while some will be killed | 3.67 | 0.47 | Agreed |
| 9 | Clean weeding of the farm is effective in walling off rodents from the farm | 2.59 | 0.60 | Agreed |
| 10 | Fencing around the farm will wall off rodents from the farm | 2.67 | 0.47 | Agreed |
| 11 | Use of rodent predators can also be useful such as cats and dogs | 2.61 | 0.49 | Agreed |
| 12 | Drumming or noise making on the farm after planting of maize seeds will be helpful | 2.94 | 0.78 | Agreed |
| 13 | Putting glue in a board and placing it along the rodents' a runway can be helpful | 2.79 | 0.41 | Agreed |
| 14 | Placing contact dusts containing rodenticides on runways of rodents will be effective | 2.92 | 0.27 | Agreed |
| 15 | Electronic traps can also be used to eradicate rodents from the farm | 3.13 | 0.94 | Agreed |

X: Mean, SD: Standard deviation and N: Number of respondents

**Research question 1:** What are the pre and post-emergence challenges of maize crops caused by rodents in Benin City?

Data in Table 1 revealed the mean of responses of farmers and agricultural extension workers on the challenges of pre and post-emergence being faced by maize farmers. The respondents agreed that items 1-10 with mean ratings between 2.70-3.77 are challenges and damages caused to maize farmers by rodents at both pre and post-emergence periods. This is so because all the means fall above the 2.50 cut-off point on a four-rating scale. The cluster mean of 3.13 further revealed that rodents are dangerous and cause damage to maize seeds and seedlings, some rodents usually pick up maize seeds from the soil immediately after sowing while others uproot maize seedlings and eat up the cotyledon. Some rodents destroy the embryo of maize seeds and some eat up maize seedlings once they shoot out from the soil. It also showed that rodents' activities increase farmers' labor and cost of production as well as reducing crop yield and quality and farmers' income. It can be deduced from the analyzed data and mean values that all the identified items in Table 1 are current challenges being faced by maize farmers in Benin City due to rodent attacks and activities.

**Research question 2:** What are the ways forward of rodents and the damage to maize at pre and post-emergence periods in Benin City?

The results in Table 2 showed the mean rating of responses of both farmers and agricultural extension workers on the ways forward of rodents and their damage to maize both at pre and post-emergence periods. The values of the mean ranged from 2.59-3.67, indicating that the responses of the respondents for all the items except item 5 fall under the agreed because they are above the cut-off point of 2.50. It can be deduced from the mean values that all the identified items in Table 2 except one are different ways maize farmers in Benin City can go about their planting of maize for maximum yields.

## DISCUSSION

The findings of the study in Table 1 revealed that 10 items on the Table are challenges beings faced by maize farmers in the study area due to rodents' activities. They are damage to seeds and seedlings, picking up of seeds from the soils immediately after sowing, uprooting of seedlings and eating up of the cotyledons, destruction of the embryo of maize seeds and eating up of maize seedlings once they shoot out. Other problems caused by rodents are increasing farmers' labour and cost of production as well as reducing the yields of crops and quality and also the income of the farmers. The findings align with the studies of Katakweba *et al*.[5] and Beleke *et al*.[6] which reported that rodents cause serious problems to humans in Africa due to their involvement in the spread of diseases in crop farms as well as losses of crops through direct consumption and spoilage. The findings also corroborated the report of Mdangi *et al*.[8] which asserted that rodents are responsible for the estimated loss of about 15% yield of maize crops in Tanzania. The findings also agreed with the report of Govindaraj *et al*.[12] where pests and disease management in maize were highlighted. Technologies and practices that can be adopted by farmers to reduce damage to seeds were also outlined. The findings also aligned with that of Norgrove[13] where it was reported that one of the major problems faced by farmers in Central Cameroon is the issue of losses of seedlings by farmers which are caused by rodents and birds.

The study in Table 2 revealed the 14 ways farmers can solve the problems of rodents in maize farms. They include; spraying seedlings with rodenticides, soaking maize seeds in chemicals before planting, early planting, crop rotation, use of scarecrows at different locations and with different colors, setting of traps, use of poison bait, clean weeding of the farm, fencing round the farm, use of rodent predators, drumming in the farm and electronic trapping of rodents amongst others. These findings aligned with the findings of Desoky[11] in a study where management strategies for rodents in maize farms were reported to include

clean weeding of the farm and closure of rodent burrows on the farm amongst others. These findings imply that using the identified methods of rodent control on maize farms will help farmers overcome the pre and post-emergence problems they usually encounter with rodents and be able to get maximum yield. These findings also agreed with the previous study, where it was revealed that rodents cause damage to cereals at pre and post-harvest time and how to combat the attack.

Addressing the challenges through research would provide the farmers, educationists and the government with the basic information needed to solve the pre and post-emergence problems of rodents in maize farming in Benin City. Also, the information provided by the study would encourage maize farmers not to give up on their production enterprise of maize. Also, the findings of this study would constitute a scheme and syllabus for educationists, schools and government at all levels on methods of controlling rodents for maize farming.

## CONCLUSION

In Benin City and other parts of the world, rodents have greatly and negatively affected grain production particularly maize, a situation that has made maize to be scarce and expensive. The study focused on ways to tackle the attacks of rodents and it is believed that when rodent management measures are put in place, farmers will obtain more yields from maize. The following recommendations are made among others: Extension workers should always engage farmers in seminars and training where they are taught how to use the methods identified by the study to control rodents on maize farms and farmers should endeavor to use the control measures identified by the study in attempt to eliminate rodents from their maize farm and maize farmers should seek knowledge from extension workers over any challenge being encountered in the planting of maize and other grain crops.

## SIGNIFICANCE STATEMENT

The study sought to identify pre and post-emergence challenges of maize crops caused by rodents in Benin City and the Ways forward of rodents and their damage to maize at pre and post-emergence periods in Benin City. The findings of the study showed that rodents do cause damage to seeds and seedlings by picking up seeds from the soils immediately after sowing, uprooting seedlings and eating up the cotyledons, destruction of the embryo of maize seeds, and eating up maize seedlings once they shoot out. Other problems caused by rodents are increasing farmers' labor, as well as the cost of production reducing the yields of crops and quality, and also the income of the farmers. Proffering solutions to these problems will enable maize farmers to cultivate maize with optimum profit.

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