



Kingdom of Saudi Arabia

Ministry of Education

**General Directorate of Education in
Qassim Region**

Alrowad National Secondary School



وزارة التعليم
Ministry of Education

Research Title:

**The Impact of Temperature on Palm Weevil Activity in Date Palm Farms
in Buraidah City**

Students, Names

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School Year: 2022/2023

Summary:

This study aims to identify the times of Palm Weevil Activity in Date Palm Farms in Buraidah City

Research Questions:

- 1- What is the link between the temperature and palm weevil activity in date palm Farms in Buraidah City?
- 2- Is there any impact of the temperature on palm weevil activity in date palm Farms in Buraidah City?

Research Assumptions:

- 1- There is a link between the temperature and palm weevil activity.
- 2- There is an impact of the temperatures and palm weevil activity.

Research Terms:

Impact: The positive and negative results resulting from the intervention of an element, whether directly or indirectly, intentionally or unintentionally.

Palm weevil: A name of a type of beetle with a snout, and it is considered one of the most dangerous insect pests that attack palm trees in the Kingdom of Saudi Arabia and many countries of the world.

Research Procedures:

The researcher used the methodology of observation by the work team in this and the methodology of interviewing the owner of a palm farm to answer the questions of the study.

Research Outcomes:

The palm weevil is more effective during hot weather (March–April–May), and this answers the study's first question that there is a link between the temperature and the activity of the palm weevil in date palm farms in Buraidah, and also answers the second question that there is an impact of the temperature on the activity of the palm weevil in Date palm farms in Buraidah.

Recommendations:

- 1- Conducting other studies that contribute to knowing more details about the palm weevil and ways to get rid of it.
- 2- Seeking the help of the official and competent authorities when there is a suspicion that there is a red weevil on the farm.
- 3- Intensifying efforts to get rid of the palm weevil.

Thanks and Appreciation

At the end of this research, we would like to express our sincere thanks and appreciation to everyone who helped us complete this research from the work team in my school, Al-Rowad National Secondary School, We also thank Mr. Badr bin Fahd Al-Marwani, the coordinator of the Globe Environmental Program in the General Directorate of Education in Qassim Region, for his efforts in coordination with the external parties related to the research. We also express our sincere thanks

to Mr. Mahmoud bin Mohamed Ezz Al-Rijal, who reviewed the research linguistically, and thanks are extended to Mr. Mohamed bin Abdul-Aal Mohamed, who translated the research. Special thanks to the Environmental Globe team at Prince Abdul-Elah Secondary School for their efforts, and their cooperation with us throughout the research period

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Research Title

The Impact of Temperature on Palm Weevil Activity in Date Palm Farms in Buraidah City

Introduction:

The date palm tree is considered an important part of the religious, cultural, and economic heritage of the Arabian Peninsula, and the Arab man was closely associated with this tree. The palm tree is considered as a source of goodness and blessings that God, the Blessed and Exalted, has favored over other trees, as it is mentioned in more than 20 verses in the Holy Qur'an. The Gulf Region is one of the most suitable areas for palm tree cultivation in the world due to its high temperature tolerance. The environmental requirements of the palm tree are compatible with the prevailing climatic conditions in the Gulf Region. The palm trees are considered as a source of food security in the world and specially in The Gulf Region as it is a semi-daily main meal for the Gulf people. The people in Qassim consider the palm tree as the special identity of the region, as it is a source of income for many entrepreneurs and a major driver for the region, and recently the so-called palm weevil appeared and damaged some farms causing harm for farmers, and it had a clear impact on the level of production and became one of the biggest threats and obstacles facing Palm farmers.

Research Problem:

The research problem is summed as follows: (The Research Questions)

What is the link between the temperature and palm weevil activity in date palm Farms in Buraidah City?

Is there any impact of the temperature on palm weevil activity in date palm Farms in Buraidah City?

Research Assumptions:

There is a link between the temperature and palm weevil activity.

There is impact of the temperatures and palm weevil activity.

Variants:

Independent: temperature

Affiliate: Palm Weevil

Research Objectives:

Identifying the times of Palm Weevil activity in date palm farms in Buraidah City.

Research Importance:

Assisting the responsible authorities and decision makers (Ministry of Water and Agriculture) in taking the necessary measures to get rid of the palm weevil.

The Study boundaries:

Time Boundaries: the year (2022 – 2023)

Spatial Boundaries: Al-Qassim region – Buraydah

Subjective Boundaries: Temperature and its impact on date palm weevil.

Research Terms:

Impact: The positive and negative results resulting from the intervention of an element, whether directly or indirectly, intentionally or unintentionally.

Temperature: An indicator of the amount of thermal energy stored by the body.

Palm weevil: A name of a type of beetle with a snout, and it is considered one of the most dangerous insect pests that attack palm trees in the Kingdom of Saudi Arabia and many countries of the world.

Date Palm: A tree belonging to the *Arecaceae* (formerly palm tree), and it is a perennial tree, with a thick stem (trunk), and the highest recorded height of it reached 28.20 m.

Theoretical framework

The official website of King Abdullah University of Science and Technology stated that the red palm weevil (its scientific name is *Rhynchophorus ferrugineus*) is a type of plant beetle that originated in tropical Asia, and spread during the past few decades, until it reached a large part of the regions of the Middle East, North Africa, and to Almost the entire Mediterranean region. weevil larvae (insects in their stage of development from egg to pre-adult form) cause severe and widespread damage to certain types of palm trees.

The weevil larvae spend their four-month life cycle inside the trunks of palm trees, working to empty them from the inside until the tree dies. It is the most destructive pest of various palm trees worldwide, including coconut palms, date palms, and oil palms. Needless to say, it is important to control the spread of the red palm weevil and its harmful effects, especially since the cultivation of dates and crops represents an important economic resource for the Kingdom of Saudi Arabia and the region in general.

An illustrative Image of the stages of palm weevil growth:

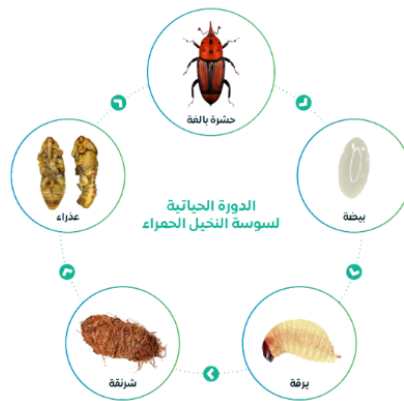


Image (1)

Professor Khaled Nabil Salama, a professor at King Abdullah University of Science and Technology, said: “Governments of many countries are committed to providing serious funding to address this plague. Palm production is a big industry, and the red palm weevil has wiped out an entire generation of trees in many countries like Malaysia, Indonesia and Spain, so it's definitely a very serious problem ”.

The Ministry of Environment, Water and Agriculture in the Kingdom of Saudi Arabia also urged farmers to report any cases of red palm weevil, through the unified reporting system "Report", which was launched by the ministry as part of its plan of digital transformation and automation of work procedures, with the aim of facilitating the request for services, submitting reports from beneficiaries and expediting procedures.

José Da Silva, the general director of Food and agriculture Organization of the United Nations, stated: "The pest that destroys palm trees by eating them from the inside can eliminate palm species, and the palm industry, unless global and coordinated measures are accelerated. The red palm weevil is one of the most dangerous insects that destroy palm trees worldwide, including the palm trees producing coconut in the Middle East, and the ornamental trees in the Mediterranean region and Europe".

The official website of the palm weevil in the Sultanate of Oman also stated: The palm weevil is one of the most dangerous insect pests that affect date palms and it is believed that its original home is India, and therefore it is also called the Indian red palm weevil. The red palm weevil insect mostly infects palm shoots and palms that are less than 14 years old for different female and male types. Infection with this insect is concentrated in the lower part of the palm tree from ground level to a height of approximately three meters from the surface of the earth. The infection is more

severe on young palms or those from which offshoots or stems are removed and the palms that have been trimmed. The red palm weevil larva is considered the harmful stage for palm trees, as it stimulates and feeds inside the bases of leaves and tree trunks, which leads to the destruction of plant tissues, weakness of trees and lack of yield. In severe infection, the leaves turn yellow and dry, and the trees become brittle and eventually die. The seriousness of the pest lies in the difficulty of recognizing the infection early in some cases, which leads to an exacerbation of the infection, and when it is discovered late, the treatment becomes useless.

Geographic Spread:

This insect spreads in many countries of the world. In Asia, it has been recorded in India, Pakistan, Bangladesh, Sri Lanka, Malaysia, Indonesia, the Philippines, Singapore, Thailand, Laos, Cambodia, Vietnam, Myanmar (Burma), China, the UAE, the Kingdom of Saudi Arabia, Qatar, Kuwait, Oman, Bahrain, Jordan, Palestine, Syria, Iran, and Turkey. It was also recorded in Australia and New Guinea, while in Africa the insect was recorded in Egypt. In Europe, it was recorded in Spain, Italy, and Greece.

Symptoms of the Insect Infestation:

It is difficult to know the stages of the beginning of the infection, as the larvae are inside the trunk and cannot be seen outside the trunk, and the damage cannot be seen directly. The later stages of the infection can be known by seeing the exit of

brown mucilage secretions with a strong bad smell from the trunk of the palm tree, or by seeing the gnawed tissues that look like, to some extent, sawdust falling on the ground around the palm tree, in addition to the yellowing and wilting of the green fronds, or the presence of cavities on the stem of the infected palm tree resulting from digging and feeding of larvae, and in the case of severe infection, the palm tree may break and fall when strong winds blow because of the cavities resulting from feeding. Images (2, 3 and 4) show the shape of the date palm tree after being infected with the palm weevil.



Image (2)



Image (3)



Image (4)

Previous Studies:

1- Al-Asfour Study (2010)

The study was about some environmental and vital aspects of the red palm weevil insect in the Kingdom of Bahrain, where the study was conducted in five palm farms infected with the red palm weevil insect in the Kingdom of Bahrain, during the period from July 2009 to June 2010. The study objective was to

determine the seasonal activity and Studying the pattern of the spatial distribution of the weevil. The results showed that the highest activity of the insect was during the months of January, February and March, and the lowest activity was in the month of September.

2- Al-Ghamdi Study (2002)

It was a field and laboratory study on the red palm weevil insect in Makkah region. In this study, the dynamic fluctuation of the red palm weevil was determined in Wadi Al-Dawasir, Bisha and Najran, after the research team was unable to find it in Makkah region. Permission was obtained from the Scientific Research Department at King Abdul Aziz University to involve some specialists from the Ministry of Agriculture and King Khalid University in order to achieve and implement one of the objectives of the research. It was found that Najran region and Wadi Al-Dawasir have severe and widespread infestation on most palm trees, especially Najran region. As for Bisha region, there were only minor infestations. The most important insect and arachnid fauna prevailing in the agricultural ecosystem of date palms were identified in Wadi Hadda al-Sham in Makkah Al-region, where the most important parasites, insect predators and real spiders were identified and their dynamic fluctuation over the last period was identified.

Research Procedures:

- The tools of Globe Environmental Program (Paper- a pen- a thermometer- a GBS Device- The website of Globe Environmental Program- a computer) as in images (5), (6) and (7).



Image (5)

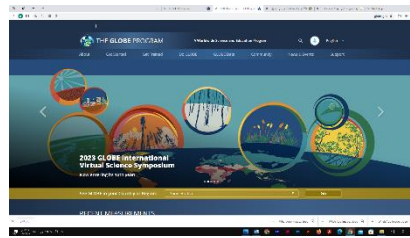


Image (6)



Image (7)

- The methodology of observation by work team and the research supervisor was used.

Images (2), (3) and (4) were printed to know the forms of the palm weevil and its impact on the date palm, and then the observation throughout the year by the work team on the date palms nearby to the school and the neighborhood as in image (8) and monitoring the temperatures from Shutter site of the Globe

Environmental program, as in image (9). We noticed that during the low temperature days, there were no indications of palm weevil activity.



Image (8)



Image (9)

In the hot days (March- April- May) we noticed that there is no clear activity of the palm weevil in a lot of palm farms, except cases in which we noticed the existence of the palm weevil as in image (10).



Image (10)

- The methodology of interviewing one farmer in the area was also used, as we met Ali bin Essa Alshomer and the interview was as follows:

1- Was your farm exposed to the palm weevil during the past two years?

Yes.

2- What is the type of soil on your farm? (Clay or sandy)

Sandy

3- In what month did you notice the activity of the palm weevil in the farm?

It appears in hot weather (March-April-May). I have only seen it in hot weather, and the cold is not suitable for it, as it lives its best days in the heat.

4- What are your experiences with the palm weevil in terms of:

A - Using pesticides and their feasibility in eliminating the palm weevil:

The farmer said (if the pesticide is used well preventively, it protects the farm from the palm weevil).

B - The appearance of the palm weevil and its impact on the life of the palm tree and its production:

The farmer said (If the palm weevil is not dealt with pesticides by a specialized team, the palm tree will be damaged).

C - From your experience, what are the best ways to deal with the palm weevil?

The farmer said:

1- Using a preventive pesticide before the appearance of the palm weevil is considered the best solution to reduce the appearance of the palm weevil.

2- Avoiding irrigation by immersion, which raises moisture at the bottom of the trunk, which leads to rotting of the lower part of it.

3- Moderation in organic and chemical fertilization, so that it does not exceed the needs of the palm tree.

- 4- Addressing the official government agencies (the branch of the Ministry of Water, Environment and Agriculture) to use preventive and therapeutic pesticides and to avoid personal conclusions.
- 5- Attention must be paid to the cleanliness of the farm and to get rid of all the remnants of pruning, fallen fruits, etc., not to be a source of attraction and reproduction of insects.
- 6- Removing weeds and fertilizing continuously, because the growth of weeds around the palm tree is an obstacle to the process of detecting the infestation, and a source of insect reproduction, and increases the humidity around the trunk of the palm tree, so that it becomes a suitable environment for the red palm weevil to lay its eggs and then multiply.
- 7- Not transferring offshoots of unknown origin to your farm contributes to immunizing them from the danger of the red weevil.

Discussion and Analysis

After completing the collection of the observation and interview information, the meeting was held with the work team as in image No. (11), and by referring to the temperature index in the Globe environmental program as in image No. (12), we found that the temperatures in the months mentioned above are the highest temperatures in the year. We found out that the palm weevil is active during the high temperature in the months (March – April – May) and also it is possible that the palm weevil is present even in the cold days (December – January – February), but its activity is not visible to the naked eye.



Image (11)

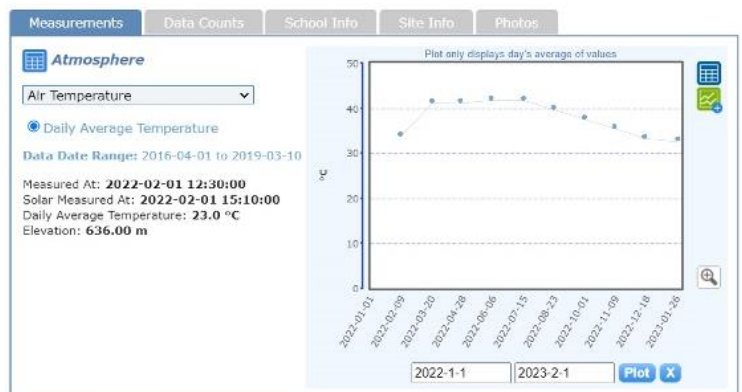


Image (12)

Outcomes:

From the above, we can conclude that weevil is more active during the hot weather (March–April–May), and this answers the study's first question about the existence of a link between the temperature and the activity of the palm

weevil in date palm farms in Buraidah, and also answers the second question about the presence of an impact of the temperature on activity Palm weevil in date palm farms in Buraidah city.

Recommendations:

- 1- Using pesticides once a month and avoiding extensive water immersion.
- 2- Seeking help from the official and competent authorities when there is a suspicion that there is a red weevil on the farm.
- 3- Paying attention to the cleanliness of the farm in general and ponds during the winter season.
- 4- Not transferring offshoots of unknown origin to the farm.
- 5- Preparing other studies that contribute to knowing more details about the palm weevil and ways to get rid of it.

Badges:

- 1- **Cooperation:** This research was prepared in a participatory and collaborative manner in all its stages, and the tasks of the main work were divided between me and my colleague with the cooperation with the science teacher, Mr. Mubarak bin Zaid to facilitate research tasks within the school, cooperation with Mrs. Faizah bin Ibrahim Bahri from the Sabya Education Department to benefit from her experience in scientific research and learn about the appropriate methodology of research, and

cooperation with the English language teacher at the school, Mr. Abdullah Fuhaid for translating the research.

- 2– **Communication with schools:** Communication was done with Prince Abdul-Elah Secondary School, Globe environmental teacher Mr. Abdullah Al-Jamhan, to help in specifying palm farms close to them for visits, and with Qais bin Assem Secondary School, as they have a professional photographer who helped us in filming.
- 3– **The Local Community:** The idea was explained to the residents of the neighborhood during a meeting of parents in the school, and they expressed their cooperation, support, and willingness to open their farms for the work team during the research stages.
- 4– **Exploring STEM professions:** We contacted Prof. Abdul Aziz Al-Raei, a faculty member at Qassim University, to take his suggestions and insights into the research procedures, and with the teacher of mathematics and statistics, Mr. Zaid Al-Obaidan, to take his insights into the temperature index in the Globe Environmental Program, as well as the teachers of biology, geology, and physics.
- 5– **Engineering Solutions:** Coordination was carried out by the Globe Environmental Coordinator in the General Directorate of Education, Mr. Badr Al-Marwani to visit the Department of Agricultural Engineering at

the College of Agricultural Technology to take their views and learning about the latest technical and engineering developments they have about their efforts against the palm weevil.

6- Data World: To answer the research questions, we relied entirely on the data we obtained through observation and interview, and from the Globe Environmental Program website.

References:

1- King Abdullah University of Science and Technology

<https://www.kaust.edu.sa/ar/news/using-sensor-technology-to-tackle-red-palm-weevils>

2- Food and Agriculture Organization

<https://www.fao.org/director-general/former-dg/director-general/my-articles/detail/ar/c/882006/>

3- Ministry of Agriculture, Fisheries and Water Resources, Sultanate of Oman

<https://www.maf.gov.om/Ministry/dynamicPage/3100>

4- The National Center of Palm Trees and Dates, KSA, Palm Care Guide.

<https://ncpd.gov.sa/>

5- Globe, Global Environmental Program Protocols.

6- Al-Asfour, Ali Ahmed, (2010). A study of some ecological and biological aspects of the red palm weevil insect in the Kingdom of Bahrain, unpublished master's thesis, Arabian Gulf University, Bahrain.

7- Al-Ghamdi, Khaled Mohamed, (2002). Field and laboratory studies on the red palm weevil insect in Makkah region, unpublished master's thesis, King Abdulaziz University, Saudi Arabia.

Poster

https://drive.google.com/file/d/1an-nkb0iZUJQ3qX26Qbg2Xp-eMnVKWRk/view?usp=share_link

Arabic search

https://drive.google.com/file/d/11Vkt9tp1YWKoRYWDhFxx7ZNjaeIZSziy/view?usp=share_link