

DAMAGE NATURE AND ECONOMIC IMPORTANCE OF THE *ORYCTES* SPP (COLEOPTERA: SCARABAEIDAE): A REVIEW

¹FERYAL HASONY SADIQ, ²FAYHAA ABBOOD MAHDI AL-NADAWI, ³SAHAR M.S. ALKHAFAJI

^{1,3} College of Agricultural Engineering, University of Baghdad

² Science dept. Basic Education College, Mustansiriyah university

Feryal Hasony Sadiq: Feryalhasony@Yahoo.Com

Fayhaa Abbood Mahdi Al-Nadawi: lnadawi@uomustansiriyah.edu.iq

Sahar M.S. Alkhafaji: sahar.muhsin1004@coagri.uobaghdad.edu.iq

ABSTRACT

Fruit- Stalk Borer *Oryctes* spp are one of the most common Date Palm trees pests in Date Palm trees cultivation areas in Iraq, the Arab world, Africa and Asia, as they cause great economic losses and Date Palm trees excavators belong to the family Dynastidae and to order Coleoptera. Review focused on three main goals related to the insect of Fruit- Stalk Borer. First aims are to identify the Fruit- Stalk Borer species that cause significant damage to Date Palm trees in Iraq and the world. Second, to demonstrate economic importance, and third, to explain Fruit- Stalk Borer life aspects. Infection with this pest leads to the small and old seedlings death when the injury reaches the internal tissue, as insect infection is one of the most important problems in the success seedlings cultivation. The greatest risk for *Oryctes* spp, larvae is that they affect the seedling crown circumference and make holes and pits that provide access to many pathogens.

KEYWORDS: *Oryctes* spp, Coleoptera, Date Palm trees, Scarabaeidae, Stalk Borer

1. INTRODUCTION

Date Palm Tree *Phoenix dactylifera* (Arecales palmae) is one of the most important and oldest fruit trees and is of great economic, environmental and social importance in Iraq and many world countries (Bob & Van .2022; Vernon ,2011; Mohammed et al. ,2012). Date Palm tree is a perennial flowering plant, Monocotyledon, which is sexually reproduced by seeds or vegetative with seedlings, and is the plants that have the grow ability in salinity high areas (Brunner et al.,2025). Date palm tree belongs to family, Arecales, which includes about 200 genera, 4000 species and is one of the most beneficial plant families for humans after the Gramineae (Mengmeng et al ,2022).

Order Arecae which the palm dates back are one of the most well-known plant orders (Anton & Struik ,2015). Iraq sits in the first ranks in Date Palm trees number, which reached 32 million in 1952, and Iraq was the first country in production and export worldwide, but The Date Palm trees number in Iraq has decreased to 14765000 Date Palm trees with an annual production of 655450 tons (Central Statistical Organization, 2014).

2. DISTRIBUTION

Recent statistics indicate. Fruit- Stalk Borer Infection increases the fatal injuries chances by preparing date Palm tree for insect pests and other pathogens, and this insect causes a production loss of 10% of the Coconut Palm trees cultivated area amounting to 16 million hectares in India (Johnson et al., 2008). Percentage infestation of Fruit- Stalk Borer of various species were amounted to 78% of the cultivated area in Jordan (Singh et al. ,2021; Samal et al. ,2023). *Oryctes* species are distributed in the most world countries and reach 43 species are mostly in Asia and Africa (Huger, 2005), *O. rhinoceros* are the most common species widespread and spread in Malaysia and the most world countries (Egonyn et al. ,2023; Shama et al., 2002; Andre et al, 2014; Pons & Albajes, 2002). Species of genus *Oryctes* spp: *Oryctes* have several species, including: *O. elegans* Prell, *O. agamemnon* Burmeister, *O. sinaicus* Walker, *O. sahriensis* de Mire, as well as other species (Aidoo et al, 2022, Tanaka, 2021).

3. ECONOMIC IMPORTANCE

Fruit- Stalk Borer *Oryctes* spp have one of the most widespread distributions in the most world regions (Filipović et al. ,2022). Infestation with this pest increases Date Palm trees fatal injuries chances by preparing Date Palm tree for insect pests and other pathogens (Egonyn et al. ,2023 ; Almaliky et al.,2012), Fruit- Stalk Borer causes losses in the South Pacific estimated at \$ 1,100,000 in 1968 due to *Oryctes* species infestations, especially *O. rhinoceros* on Coconut Palm trees *Cocos nucifera* and Oil Palm *Elais guineensis*, as Johnson et al. (2001) mentioned that the insect Fruit-Stalk Borer *O. rhinoceros* causes a production loss estimated at 10% of the planted area with coconut palm trees of 1.696 million hectares, in India and that the Date palm trees injury rate in the Fruit- Stalk Borer of various species in Jordan, as it reached 78% of the cultivated area (Singh et al. , 2021 ;Samal et al. ,2023). *O. monoceros* species causes a 40% production loss in Africa, and

damage is caused by the adults feeding on the small palm trees (Antal et al, 2023), while, percentage infested reached 100% in Tunisia (Van Herk & Vernon., 2007).

4. INJURY AND DAMAGE NATURE

Adult insects (causing damage) attack modern fronds and severe injuries lead to Date Palm trees death, so these are insect species are Date Palm trees dangerous pests. Infestation with this pest leads to the Young and mature offshoots seedlings death when the injury reaches the internal tissue, as insect infestation is one of the most important problems in the success seedlings cultivation and most injuries begin when Date Palm trees leaves begin to uniquely, especially when the Leaf opening of 6-4 fronds is exposure to injury and this beetle infection is considered one of the most dangerous and most harmful infection types when the inflorescences open and the lameness elongates (Allemann et al., 2004; Etebari et al, 2021).

Van Herk & Vernon (2007) indicated that the greatest risk for *O. agamemnon* larvae is that they affect the seedling crown circumference and make holes and pits that provide access to many pathogens (Marshall et al., 2017), and the continued larvae feeding and the digging expansion and the access of the larvae to Adventitious roots, which leads to date Palm tree weakness and the its ease breaking and death. The seedlings Insect infestation at the age of 1-2 years, which leads to stunted growth and complete destruction as the fronds are twisted (Almaliky et al.2012), the compressed and clumped together leaves, yellowish and die, in addition to the insect infesting the weeds associated with the mother tree.

5. INSECT LIFE ASPECTS

5.1 EGGS STAGE

The laid eggs number varies from one species to the other, as the species *O. rhinoceros* lays 12-8 eggs / female, and species *O. monoceros* lays on average 14 eggs / female, while the laid eggs average number laid of the species *O. boas* was 7 eggs / female (Egony et al., 2023). Tabein et al. (2025) indicated that the species *O. elegans* eggs shape resembles a rice grain and is a yellowish-white oval that is scattered on the fibres and dispersed.

No eggs were found implanted in the tissue of the inflorescences or trunk because there was no specialized device for laying eggs in the female (Ovipositor). Species this / female and sometimes the larvae head capsule is clearly seen through the egg transparent membrane that remains 14.3 days and that the eggs incubation period for species *O. agamemnon* is 13 days and for species *O. rhinoceros* 8-12 days and eggs number average of the species eggs hatched after 9-19 days, the female does not lay her eggs in one place, but rather distributes it over several of Date Palm trees (Tanaka et al, 2021).

5.2 LARVAL STAGE

Kuhar & Alvarez (2008) found the species feeding *O. elegans*, *O. monoceros*, *O. rhinoceros*, in vitro on plant materials have two species *O. elegans* and *O. rhinoceros* is more adaptive than the species *O. monoceros*, due to the Mortality rate number and the larvae slow growth that result to small and sterile adults. Egony et al., (2023) mentioned that the larval phase development period varies according to The Fruit- Stalk Borer species, environmental conditions, and the feeding type. First larval stage development duration was 15.5,14,13,10 days, second larval phase duration was 21,12,14,16.5 days and third larval stage duration was 59,56,70,112.5 days for the *O. rhinoceros*, *O. boas*, *O. monoceros*, *O. elegans* species respectively.

5.3 PUPAE STAGE

Pre-pupae and pupae duration varied by species and amounted to 10,9,8,10.5 days for the pre-pupae stage and 14,17,15,22.5 days for the species pupae stage *O. rhinoceros*, *O. boas*, *O. monoceros*, *O. elegans* respectively (Egony et al., 2023). Van Herk & Vernon (2007) mentioned that the species pupae of the *O. agamemnon* formed at the beginning of its formation inside the larvae and works a T-shaped rift to emerge during pupation, and The pupa is inactive, white in the first hours of its formation and gradually colouring it to a light brown colour with a length of 39.2 mm and a width of Mid-body is 27.4 mm, and its duration is 19 days (Lehmhus & Niepold, 2013).

5.4 ADULT STAGE

indicated that newly emerging adults remain within the Pupal chamber of 17 to 13 days of Emergence. and during the pre-ovipositional period, all insect organs, including the reproductive system, complete and the sexual ratio for males and females is 1.8:(Vernon, 2005; Razzaq et al. 2025; Atwa, 2018). Sexual ratio of the species *Oryctes agamemnon* to male and female 1: 2 and female dies after eggs deposition (Van Herk & Vernon ,2007).

REFERENCES

- [1] Atwa AA. (2018) Biological Control Potential of Two Steinernematid Species Against the Date Fruit Stalk Borer (*Oryctes elegans* Prell, Coleoptera: Scarabaeidae). Journal of Insect Science (Online). 2018 May;18(3). <https://doi.org/10.1093/jisesa/iey060>. PMID: 29931123; PMCID: PMC6009653.
- [2] Anton, H., A. and P. C. Struik, (2015). Yield levels of potato crops: recent achievements and future prospects." Field Crops Research 182: 76-85. <https://doi.org/10.1016/j.fcr.2015.06.002>

- [3] Allemann, J., S. M. Laurie, S. Thiart, H. J. Vorster, and C. H. Bornman, (2004). Sustainable production of root and tuber crops (potato, sweet potato, indigenous potato, cassava) in southern Africa. *South African Journal of Botany*, 70(1), 60-66. [https://doi.org/10.1016/S0254-6299\(15\)30307-0](https://doi.org/10.1016/S0254-6299(15)30307-0)
- [4] Andre, C. M., S. Legay, C. Iammarino, J. Ziebel, C. Guignard, Y. Larondelle, and L. M. Miranda, (2014). The potato in the human diet: a complex matrix with potential health benefits. *Potato Research*, 57(3), 201-214. <https://doi.org/10.1007/s11540-015-9287-3>
- [5] Aidoo, O.F., Ding, F., Ma, T. *et al.* (2022). Determining the potential distribution of *Oryctes monoceros* and *Oryctes rhinoceros* by combining machine-learning with high-dimensional multidisciplinary environmental variables. *Sci Rep* 12, 17439. <https://doi.org/10.1038/s41598-022-21367-1>
- [6] Antal Nagy, A. H. and K. Szanyi., (2023). Distribution of economically important click beetles and the first record of *Agriotes sordidus* Illiger in Hungary. *Journal of Central European Agriculture*, 2023, 24(4): 899-907. <https://doi.org/10.5513/JCEA01/24.4.3965>.
- [7] Almaliky B. S. A. , Zainal Abidin, M. A. , Kader, J. and Wong , M. Y. (2012). First Report of *Marasmiellus palmivorus* Causing Post-Emergence Damping Off on Coconut Seedlings in Malaysia. The American Phytopathological Society (APS). <https://doi.org/10.1094/PDIS-07-12-0627-PDN>
- [8] Bob V., and W. Van. (2022). Insect Pests of Potato (Second Herk Edition) Global Perspectives on Biology and Management, pp:103-148. <https://doi.org/10.1016/B978-0-12-821237-0.00020-2>.
- [9] Brunner M., R. Favaro, W. G. van Herk, P. Bogaerts, O.R. Rubbmark, S. Angeli and M. Traugott. (2025). Olfactory preference in chemical host plant recognition by male and female click beetles and its implications for pest management. *Pest Management Science* <https://doi.org/10.1002/ps.8817>.
- [10] Central Statistical Organization, Annual Statistical. (2014). Baghdad, Republic of Iraq. <https://cosit.gov.iq/ar/1146-2014>
- [11] Etebari, K.; Gharuka, M.; Asgari, S.; Furlong, M.J. (2021). Diverse Host Immune Responses of Different Geographical Populations of the Coconut Rhinoceros Beetle to *Oryctes Rhinoceros Nudivir* (OrNV) Infection. *Microbiology Spectrum*. 2021 Oct;9(2): e0068621. <https://DOI:10.1128/spectrum.00686-21>. PMID: 34523987; PMCID: PMC8557903.
- [12] Egonyu, J., Olubowa, R., Tanga, C., Cheseto, X., & Subramanian, S. (2023). Rhinoceros beetle (*Oryctes* sp.) larvae as a nutrient rich delicacy: a comparison of nutrient profiles from four counties in western Kenya. *Journal of Insects as Food and Feed*, 10 (1), 79-90. <https://doi.org/10.1163/23524588-20230004>.
- [13] Filipović I, Rašić G, Hereward J, et al. A high-quality de novo genome assembly based on nanopore sequencing of a wild-caught coconut rhinoceros beetle (*Oryctes rhinoceros*). *BMC Genomics*. 2022 Jun;23(1):426. <https://doi:10.1186/s12864-022-08628-z>. PMID: 35672676; PMCID: PMC9172067.
- [14] Johnson, S. N., E. A. Anderson, G. Dawson and D. W. Griffiths (2008). Varietal susceptibility of potatoes to wireworm herbivory// *Agricultural and Forest Entomology*. N 10.- P. 167-174. <https://doi.org/10.1111/j.1461-9563.2008.00372.x>.
- [15] Huger AM. The *Oryctes* virus: its detection, identification, and implementation in biological control of the coconut palm rhinoceros beetle, *Oryctes rhinoceros* (Coleoptera: Scarabaeidae). *Journal of Invertebrate Pathology*. 2005 May;89(1):78-84. <https://doi:10.1016/j.jip.2005.02.010>. PMID: 16039308.
- [16] Kuhar, T. P. and J. M. Alvarez, (2008). Timing of injury and efficacy of soil-applied insecticides against wireworms on potato in Virginia. *Crop Prot.*; 27:792–798. <https://doi.org/10.1016/j.cropro.2007.11.011>.
- [17] Lehmhus, J. and F. Niepold.,(2013). New finds of the click beetle *Agriotes sordidus* (Illiger, 1807) and an overview on its current distribution in Germany. *Journal für Kulturpflanzen*, 65, pp:309-314. <https://doi.org/10.5073/JFK.2013.08.02>.
- [18] Marshall SDG, Moore A, Vaqalo M, Noble A, Jackson TA. (2017). A new haplotype of the coconut rhinoceros beetle, *Oryctes rhinoceros*, has escaped biological control by *Oryctes rhinoceros nudivir* and is invading Pacific Islands. *J Invertebr Pathol*. 2017 Oct;149:127-134. <https://doi:10.1016/j.jip.2017.07.006>. Epub 2017 Jul 22. PMID: 28743668.
- [19] Mohammed, K. ;A. K. Shbar;; H. Falah, ; N. F. Naher, ; B. Jabo, ; A. Hasan, and R. A. Sami, (2012). Activity of Insect Fauna during the Night in the Palm Orchards of Central Iraq. May 2012. *Journal of Food Science and Engineering* 2(5):277-282. <https://DOI:10.17265/2159-5828/2012.05.005>.
- [20] Mengmeng Hao, Owusu Fordjour Aidoo, Yushu Qian, Di Wang, Fangyu Ding, Tian Ma, Elizabeth Tetey, Kodwo Dadzie Ninsin, Angelina Fathia Osabutey, Christian Borgemeister, .(2022). Global potential distribution of *Oryctes rhinoceros*, as predicted by Boosted Regression Tree model, *Global Ecology and Conservation*, Volume 37,2022, e02175,ISSN 2351-9894, <https://doi.org/10.1016/j.gecco.2022.e02175>. (<https://www.sciencedirect.com/science/article/pii/S2351989422001779>)
- [21] Pons X. and R. Albajes, (2002). Control of maize pests with Imidacloprid seed dressing treatment in Catalonia (NE Iberian Peninsula) under traditional crop conditions. *Crop Prot.*; 21:943–950. [https://doi.org/10.1016/S0261-2194\(02\)00069-8](https://doi.org/10.1016/S0261-2194(02)00069-8).
- [22] Razzaq, S. A.; H. H. Al-Saffar; Haider, N. Al-Ashbal, (2025). A Survey of Insects Accompanying Animal Fecal from Different Regions of Iraq, *Journal of Bioscience and Applied Research*. Volume 11, Issue 1, March 2025, Pages 142-167. <https://doi:10.21608/jbaar.2025.418543>.

- [23] Singh, B., V. Bhardwaj, K. Kaur, S. Kukreja, and U. Goutam, (2021). Potato periderm is the first layer of defence against biotic and abiotic stresses: a review. *Potato Research*, 64(1), 131-146. <https://doi.org/10.1007/s11540-020-09468-8>.
- [24] Samal, I., T. K. Bhoi, P. K. Majhi, S. Murmu, A. K. Pradhan, D. Kumar, and T. A. Balawi, (2023). Combatting insects mediated biotic stress through plant associated endophytic entomopathogenic fungi in horticultural crops. *Frontiers in Plant Science*, 13, 1098673. <https://doi.org/10.3389/fpls.2022.1098673>.
- [25] Sharma, H. C., J. H. Crouch, K. K. Sharma, N. Seetharama, and C. T. Hash, (2002). Applications of biotechnology for crop improvement: prospects and constraints. *Plant Science*, 163(3), 381-395. [https://doi.org/10.1016/S0168-9452\(02\)00133-4](https://doi.org/10.1016/S0168-9452(02)00133-4).
- [26] Tabein S, Nazarpour D, Hegazy A, et al. Diverse viral communities inhabit the guts of date palm rhinoceros beetles (*Oryctes* spp.). *Journal of Invertebrate Pathology*. 2025 Jul; 211:108321. doi: 10.1016/j.jip.2025.108321. PMID: 40157533. <https://doi.org/10.1016/j.jip.2025.108321>
- [27] Tanaka S, Harrison RL, Arai H, et al. (2021). Confirmation of *Oryctes* rhinoceros Nudivirus infections in G-haplotype coconut rhinoceros beetles (*Oryctes rhinoceros*) from Palauan PCR-positive populations. *Scientific Reports*. 2021 Sep;11(1):18820. <https://doi:10.1038/s41598-021-97426-w>. PMID: 34545119; PMCID: PMC8452681.
- [28] Van Herk W. G. and R. S., Vernon. (2007). Soil bioassay for studying behavioral responses of wireworms (Coleoptera: Elateridae) to insecticide-treated wheat seed. *Environ. Entomol.*; 36:1441–1449. [https://doi:10.1603/0046-225X\(2007\)36\[1441:SBFSBR\]2.0.CO;2](https://doi:10.1603/0046-225X(2007)36[1441:SBFSBR]2.0.CO;2).
- [29] Vernon R. S., (2005). Aggregation and mortality of *Agriotes obscurus* (Coleoptera: Elateridae) at insecticide-treated trap crops of wheat. *J. Econ. Entomol.*; 98:1999–2005. <https://doi:10.1603/0022-0493-98.6.1999>.
- [30] Vernon, R. S., W. G. Van Herk, M. Clodius and C. Harding., (2011). Crop protection and mortality of *Agriotes obscurus* wireworms with blended insecticidal wheat seed treatments. *J. Pest Sci.*; 86: 137-150. <https://doi:10.1007/s10340-011-0392-z>.