



THE APPLICATION OF WARFARIN AS FGAR (FIRST GENERATION ANTICOAGULANT RODENTICIDE) ON THE NORWAY RAT (RATTUS NORVEGICUS) AT PUCHONG, SELANGOR

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By

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**A Project Report Submitted in Partial Fulfilment of the Requirement
for the Degree of Bachelor of Agriculture Science in the Faculty of Agriculture
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DEDICATION

My parents, Mr. Sharifmalim bin Junaidi and Mrs. Rabuyah binti Rosli

My family and relatives

Fairol Hishammalim, Fazarina Malim, Fadzillah Malim and Mohamad Fadzil Malim

My best friends

Luqman Nul Hakim Isa, Mohamad Ameerul Ishak, Mohamad Faiz Wahid, Mohd

Firdaus Yazid, Mohamad Hafizul Yusran, Muhammad Alif Yaacob and

Mohamad Zainifazli Zahari

And

My supervisor

Assoc. Prof. Dr. Hafidzi Mohd Noor

ABSTRACT

The application of Warfarin as FGAR (First Generation Anticoagulant Rodenticide) on the Norway rat (*Rattus norvegicus*) at Puchong, Selangor

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Taman Puchong Permai is one of the metropolitan residential parks that is keeping up from time to time in corresponding with the pursuit of advanced state status of Malaysia. Located 25 km from Kuala Lumpur, Taman Puchong Permai also a highly populous area and have a prodigious food destination. The increase in the number of eating outlets in Puchong area has resulted in some unwanted guests, uncontrolled rat's infestation. These would risk the people being exposed to chronic diseases such as Leptospirosis and Salmonella. In this study, we would like to evaluate the effectiveness of warfarin rodenticide towards Norway rat's population in the area. Rat population was estimated before and after one-week baiting phase from 2300H until 0000H. Three different areas; dining area (3°0'40.55"N 101°35'52.35"E), landfill area (3°0'39.85"N 101°35'52.80"E) and residential area (3°0'39.88"N 101°35'59.99"E) were selected for this study. The different rat species was found in the area; the Norway rat (*Rattus norvegicus*) and Asian house shrew (*Suncus murinus*). The Norway rat population was found to be reduced 35% compared to before warfarin application. The trapping success of the species also affected, where its reduced from 11.11% to 8.70% due to probably trap and bait shyness developed after the baiting. As a nutshell, warfarin is a relevant anticoagulant rodenticide to be used in Taman Puchong Permai to control the population of a commensal rodent; Norway rat. However, proper disposal and food waste management would contribute more to keeping Norway rat population under the threshold.

ABSTRAK

Penggunaan Warfarin sebagai Rodentisida Antikoagulan Generasi Pertama (RAGP) pada tikus Norway (*Rattus norvegicus*) di Puchong, Selangor

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Taman Puchong Permai adalah salah satu taman kediaman metropolitan yang berkembang dari semasa ke semasa selaras dengan status negara Malaysia yang semakin membangun. Terletak 25 km dari Kuala Lumpur, Taman Puchong Permai juga merupakan kawasan yang mempunyai populasi penduduk yang sangat ramai dan mempunyai destinasi makanan yang menarik. Peningkatan bilangan kedai makan di kawasan Puchong telah mengakibatkan beberapa masalah yang tidak diingini iaitu peningkatan populasi tikus yang tidak terkawal. Ini akan membahayakan orang yang terdedah kepada penyakit kronik seperti Leptospirosis dan Salmonella. Dalam kajian ini, kami telah menilai keberkesanan warfarin rodentisida terhadap populasi tikus Norway di kawasan tersebut. Populasi tikus dihitung sebelum dan selepas fasa umpan dipasang dalam tempoh satu minggu dan dari jam 2300H hingga 0000H. Tiga kawasan berbeza; kawasan kedai makan (3°0'40.55"N 101°35'52.35"E), kawasan pelupusan sampah (3°0'39.85"N 101°35'52.80"E) dan kawasan kediaman (3°0'39.88"N 101°35'59.99"E) dipilih untuk kajian ini. Spesies tikus yang berbeza telah ditemui di kawasan tersebut; tikus Norway (*Rattus norvegicus*) dan cencurut (*Suncus murinus*). Populasi tikus Norway didapati berkurangan 35% berbanding sebelum aplikasi warfarin. Kejayaan memerangkap tikus juga telah terjejas, di mana penurunan dari 11.11% hingga 8.70% disebabkan oleh malu perangkap dan umpan yang timbul setelah umpan dipasang. Secara ringkasnya, warfarin adalah rodentisida antikoagulan yang relevan untuk digunakan di Taman Puchong Permai untuk mengawal populasi tikus komensal; tikus Norway. Walau bagaimanapun, pelupusan dan pengurusan sisa makanan yang sewajarnya akan menyumbang lebih banyak untuk menjadikan populasi tikus Norway di bawah ambang yang boleh dikawal.

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APPROVAL SHEET

I certify that this research project report entitled “The application of Warfarin as FGAR (First Generation Anticoagulant Rodenticide) on the Norway rat (*Rattus norvegicus*) at Puchong, Selangor” by Faizulnizam Malim bin Sharifmalim has been examined and approved as a partial fulfillment of the requirements for the Degree of Bachelor of Agriculture Science in the Faculty of Agriculture, Universiti Putra Malaysia.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Norway rat (*Rattus norvegicus*) has been established from 300 years ago because of expansion of industrial revolution, agriculture, and mankind from days to days. Due to negative effects that brought by Norway rats on community health, faunas health, and agriculture, it is considered the most significant vertebrate urban pests.

Puchong Permai is a housing park area located in Puchong, Selangor, Malaysia. It is close to Puchong Permata, Taman Puchong Prima, and Puchong Perdana. Nearly 90% of the area is populated by the Malay community that mostly has a moderate salary. Many food outlets built around Taman Puchong Permai to generate income of the community surrounding. Therefore, the population of rats is increasing as there are many food foundations in the area. The presence of rats in Puchong Permai housing area has brought several negative effects, serious and critical illnesses especially to residents around the area such as Leptospirosis and Salmonella diseases.

To prevent and reduce rat population, various methods have been implicated by residents and Majlis Perbandaran Subang Jaya (MPSJ) or Subang Jaya Municipal Council zones Puchong. One of them is to place rodenticide as a bait in areas where rat population is quite serious. First generation anticoagulant, warfarin is one of the active ingredients found in rodenticide that has been used to reduce the number of rat populace in the area. Because the rats are resistant to the first-generation anticoagulant rodenticide, their population decreases with a slight and at a slow rate. Warfarin resistance was first discovered among Norway rat (*Rattus norvegicus*) populations in

Scotland in 1958 and further reports of resistance, both in this species and in others, soon followed from other parts of Europe and the United States. (Buckle, Prescott, & Ward, 1994)

Previous studies have found that the use of warfarin is no longer relevant as rats have been resistant to it. These tests accurately reflect a resistance situation in which warfarin is almost useless for the control of Norway rat populations containing a high percentage of resistant animals (Buckle et al., 1994). Therefore, this study is conducted to ensure that warfarin is still relevant and can be used as a rodenticide to reduce rat population.

From 26 – 28 March 2018, we came to the study area to calculate how many rat population was there. Then, we put a trap containing bait to catch some rats and calculate the amount of them to be recorded. A week after that, we placed a pipe containing rodenticide, warfarin. A total of 30 grams of warfarin is placed in each of the pipes. We come periodically to see a decline in the amount of warfarin that has been eaten by rats. The surrounding area was observed to make sure if there were dead rats. From 24 – 26 April 2018, we placed a live trap to calculate the number of rats to be capture and comparing the results with pre-baiting phase's results. Some scientific calculation is done to differentiate the results of before and after we put warfarin to study the effectiveness of the first-generation anticoagulant.

1.2 Objectives

1. To identify the commensal rodent species exists in Taman Puchong Permai.
2. To estimate the population abundant of *Rattus norvegicus* before and after warfarin bait application
3. To evaluate trapping success of *Rattus norvegicus* before and after warfarin baiting.



REFERENCES

Adrichem, M. H. C. Van, Buijs, J. A., Goedhart, P. W., & Verboom, J. (n.d.). Factors influencing the density of the Norway rat (*Rattus norvegicus*) in and around houses in Amsterdam, *56*(2), 77–91.

Agrochemicals, Z. (1997). Ranging behavior and habitat utilization of the Malayan wood rat (*Rattus tiomanicus*) in an oil palm plantation in Johore, Malaysia, *16*(5), 467–473.

Battersby, S. A., Parsons, R., & Webster, J. P. (2002). Urban rat infestations and the risk to public health. *Journal of Environmental Health Research*, *1*(2), 4–12.

Brunton, C. F. A., Macdonald, D. W., & Buckle, A. P. (1993). Behavioral resistance towards poison baits in Norway rats, *Rattus norvegicus*. *Applied Animal Behaviour Science*, *38*(2), 159–174. [https://doi.org/10.1016/0168-1591\(93\)90063-U](https://doi.org/10.1016/0168-1591(93)90063-U)

Buckle, A. P., Prescott, C., & Ward, K. J. (1994). Resistance to the first and second generation anticoagulant rodenticides: a new perspective, (February). Retrieved from <http://centaur.reading.ac.uk/27517/>

Caslick, J. W., & Decker, D. J. (1980). Rat and mouse control. *Cornell Cooperative Extension, Bulletin 1*.

Cox, P., & Smith, R. H. (1992). Rodenticide ecotoxicology: pre-lethal effects of anticoagulants on rat behavior. Vertebrate Pest Conference Proceedings Collection, (March), 165–170.

Eilam, D., & Golani, I. (1990). (*Rattus norvegicus*), *36*, 161–170.

Guillory, J. (2002). Coumadin: The Story of a Drug. *Southeast Texas Medical Associates, L.L.P.*, 3. <https://doi.org/10.4187/respcare.01831>

Haniza, M. Z. H., Adams, S., Jones, E. P., Macnicoll, A., Mallon, E. B., Smith, R. H., & Lambert, M. S. (2015). Large-scale structure of Norway rat (*Rattus norvegicus*) populations in England: effects on rodenticide resistance, 1–20. <https://doi.org/10.7717/peerj.1458>

Jaya, P., Council, M., & Jaya, P. (2007). Ectoparasites of *Rattus sp* from Petaling Jaya, Selangor, Malaysia, 30(March 2002), 11–16.

Journal, M., Veterinary, O. F., Premaalatha, B., Chandrawathani, P., Priscilla, F. X., T, F. H. M., Ramlan, M. (2017). Malaysian Journal of Veterinary Research A Survey of Endoparasite And Ectoparasite Infections Of Wild Rats Caught In Areas Of Ipoh And Kuala Lumpur, Malaysia, 29–34.

Khan, J. A. (1992). The efficiency of ‘Wonder’ traps against ‘roof’ rat, *Animal Behaviour*, 34, 175–180.

Leahy, B. R., & Daniels, D. (2013). Department of Pesticide Regulation.

Leong, N. L., Hurng, J. M., Djomehri, S. I., Gansky, S. A., Ryder, M. I., & Ho, S. P. (2012). Age-Related Adaptation of Bone-PDL-Tooth Complex: *Rattus-Norvegicus* as a Model System, 7(4). <https://doi.org/10.1371/journal.pone.0035980>

Lim, B., & Liat, B. (n.d.). The field rats and field mouse in Malaysia and Southeast Asia, 35–42.

Meerburg, B. G., Singleton, G. R., & Kijlstra, A. (2009). *Rodent-borne diseases and their risks for public health*. <https://doi.org/10.1080/10408410902989837>

Morphology, D. (2010). Norway Rat aka Norway rat *Rattus norvegicus* (Berkenhout) Fact Sheet: Norway Rat aka Norway rat Photo Credits: Lower Left image of 2 Norway Rats on the drain.

Nursheena, S., Zain, M., Arnez, S., Khalil, S., Braima, K. A., Abdul-Aziz, N. M., Jeffery, J. (2015). Ectoparasites of murids in Peninsular Malaysia and their associated diseases, 1–10. <https://doi.org/10.1186/s13071-015-0850-1>

Pascal, P. (1912). *Rattus norvegicus*.

Poche, R., Poché, D., Poché, R. M., Poché, D. M., & Laboratories, G. (2012). Rodenticides: Warfarin, still a good management Tool Rodenticides: Warfarin, Still A Good Management Tool Part 1: First and Second-Generation Anticoagulants, (November 2014), 11–15. <https://doi.org/10.1564/23jun11>

Rat Infestations in Malaysia Leptospirosis Cases in. (2014), *343218*(1), 343218.

Rattus norvegicus. (1954), 243–244.

Sacchi, R., Gentili, A., Pilon, N., & Bernini, F. (2008). GIS-Modelling the Distribution of *Rattus norvegicus* In Urban Areas Using Nontoxic Attractive Baits. *Hystrix*, *19*(1), 13–22. <https://doi.org/10.4404/Hystrix-19.1-4410>

Simonetti, J. (1986). On the assessment of trapping success. *Acta Theriologica*, *31*(14), 171–175. Retrieved from <http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:On+the+Assessment+of+Trapping+Success#2>

Smith, P., Berody, M., Smith, R. H., & Macdonald, D. W. (1993). A new aspect of warfarin resistance in wild rats: benefits in the absence of poison. *Functional Ecology*, *7*(October 2017), 190–194. <https://doi.org/10.2307/2389886>

Species Fact Sheet: Norway rat (*Rattus norvegicus*). (n.d.), 8023.

Syazana, N., Zain, M., & Jeffery, J. (2013). Biodiversity and Macroparasitic Distribution of The Wild Rat Population of Carey Island, Klang, *30*(2), 1–12.

Traweger, D., Travnitzky, R., Moser, C., Walzer, C., & Bernatzky, G. (2006). Habitat Preferences and Distribution of The Norway rat (*Rattus Norvegicus* Berk.) In the City of Salzburg (Austria): Implications for An Urban Rat Management. *Journal of Pest Science*, *79*(3), 113–125. <https://doi.org/10.1007/S10340-006-0123-Z>