

Effects of the Herbal Joss Strick by Using Saabseua and Community Participation to Reduce the Incidence Rate of Dengue Fever in the Suburban Area of Thailand: A Quasi-Experimental Study

Phannathat Tanthanapanyakorn¹, Naphatsaran Roekruangrit¹, Aree Sanguanchue¹, Apinya Uttarachai¹, Mayuree At-Narong², Narakorn Huadon¹, Itsariya Thanaphatchosakul¹, Natthawadee Poo Sri¹, Sabaitip Nark-im¹

¹Faculty of Public Health, Valaya Alongkorn Rajabhat University under the Royal Patronage, Pathum Thani, Thailand, 13180

²Khlong Luang Hospital, Khlong Luang District, Pathum Thani, Thailand, 12120

Email address: phannathat.tan@vru.ac.th, nj_nunew@hotmail.com, AREENUENG06@gmail.com, apinya_ph_ph@hotmail.com, artna_635@hotmail.com, narakorn.hua@vru.ac.th, itsariya0707@gmail.com, fernpoo Sri18@gmail.com, titoy6120@gmail.com

Abstract— Suburban areas are lower density areas that separate residential and commercial areas from one another. They are either part of a city or urban area, or exist as a separate residential community within commuting distance of a city. Dengue fever is a mosquito-borne tropical disease caused by the dengue virus. Dengue is spread by several species of female mosquitoes of the *Aedes* genus, principally *Aedes Aegypti*. The objective of this study was to evaluate the herbal joss strick by using Saabseua and community participation to reduce the incidence rate of dengue fever in the suburban Area of Thailand before and after 2-weeks intervention program. This is a one-group design of Quasi-experimental study. The 35 samples who were lived in the suburban area of Thailand and participated with the intervention program by voluntary. All of the participants were measured the knowledge and attitude about dengue fever, the house index (HI) of larval indicators and the incidence rate of dengue fever. The Shapiro–Wilk test was used to test of normality in all of variables and the paired-sample t-test was used for comparison before and after 2-weeks intervention program within the group. The results showed that the knowledge and attitude about dengue fever were increased significantly after 2-weeks intervention program ($p < 0.001$). Beyond, the HI and the incidence rate of dengue fever were decreased significantly after 2-weeks intervention program ($p < 0.001$). The finding suggests that the healthcare provider should apply to implement the herbal joss strick by using Saabseua and community participation to prevent and control the dengue fever problem in the suburban area of Thailand.

Keywords—Saabseua, Intervention, Dengue Fever, Suburban Area

I. INTRODUCTION

Dengue viruses are spread to people through the bite of an infected *Aedes* species (*Ae. aegypti* or *Ae. albopictus*) mosquito. Dengue is common in more than 100 countries around the world [1]. There is violence and its major public health problem of the tropical country [2]. From the surveillance data of the Department of Disease Control of Thailand [3] reported that the incidence rate of dengue fever in 2020, it was showed that there were 25,708 cases of nationwide and 15 of them death, the most common age group was ranged between 15-24 years old, followed by 10-14 years

old and 25-34 years old, respectively. According to the patient's distribution data, there were distributed across all regions of the country.

Suburban area or suburbia is a mixed-use or residential area, existing either as part of a city or urban area or as a separate residential community within commuting distance of a city [4]. Suburban area is tended to proliferate around cities that have an abundance of adjacent flat land [5]. Suburban was emerged on a large scale in the 19th and 20th centuries as a result of improved rail and road transport, which led to an increase in community [6]. In general, they have lower population densities than inner city neighborhoods within a metropolitan area, and most residents commute to central cities or other business districts. Suburban residents, particularly those with lower incomes, may face unique barriers to health care access beyond simply lacking coverage [7]. Moreover, some area is the wilderness area, it may be a breeding place for *Aedes* mosquitoes in the community.

Pathum Thani Province is a suburban area of Thailand which having many characteristics of the population and high incidence rate of dengue fever. The results showed that a total of 58 cases were reported with the morbidity rate per 100,000 population in the years 2020. Especially, KlongLuang District is the high case of dengue fever area was increased of the incidence rate per 100,000 population between with the morbidity rate per 100,000 people in 2012-2020 (73.3 in the year 2012, 29.19 in the years 2014, 524.50 in the years 2018 and 157.2 in the years 2019, respectively. As the results, trends outbreaks of dengue fever were affected with the population in the community in every year, the current dengue epidemic season can find more cases spread monthly and increasing between May and November [8].

Saabseua or *Eupatorium odorata* is a weed that has many biological activities. Therefore, this research was interested to develop the Herbal Joss Strick to repellent *Aedes aegypti* for preventing the dengue fever infection. Moreover, Saabseua is one of the herbs that there are very easy to find and widely

available in the suburban community [9]. It is classified as a weed with various useful medicinal properties. The Herbal Joss Strick to repellent *Aedes aegypti* was made from a mixture of Saabseua leaf and kaffir lime skin, it is made together as an incense and was used to repellent mosquitoes [10] which is a natural material without toxic substances, did not harmful to health and can also repel mosquitoes.

For prevention and control the dengue fever, the community participation and community wisdom are very crucial to reduce the incidence rate of dengue fever. This intervention program was developed by the epidemiology triangle of the diseases. The triad consists of an external agent, a susceptible host, and an environment that brings the host and agent together. In this model, disease was resulted from the interaction between the agent and the susceptible host in an environment that supports transmission of the agent from a source to that host. Conclusion, agent, host, and environmental factors interrelate in a variety of complex ways to produce disease. The Developing of the appropriate, practical, and effective public health measures to control or prevent disease usually requires assessment of all three components and their interactions [11]. This program was used herbal joss strick by using Saabseua and community participation to reduce the incidence rate of dengue fever in the suburban area of Thailand.

II. METHOD

The program was a one-group of the Quasi-experimental study to compare the knowledge, attitude about dengue fever, the house index (HI) of larval indicators and the incidence rate of dengue fever before and after 2-weeks intervention program and did not blind. This program was recruited the participants from the suburban community of Thailand and founded the mosquito larva in house. The study area is PathumThani Province which is high incidence rate of dengue fever and increased in very years [12]. This program was assigned into one group design. The participants were received health education, the activity to change of attitude about dengue fever and the main of intervention which they were received the Herbal Joss Strick by using Saabseua to repellent *Aedes aegypti* in their house. The intervention was conducted between January 2021 to March 2021 through the observational structural-interview and assessment forms. This was designed to 2-weeks intervention program.

A. Participants

The participants were recruited from population from KlongLuang District, PathumThani Province of Thailand. This is a suburban area which located in the central region of country. The participants who were founded the mosquito larva in their house and participated in this study by voluntary. Moreover, this program was excluded the participant who were allergized with incense scent from the study.

The purposive random sampling was used to select the participants into the study. As the sample size of this study was calculated by the G-power program which using the confidence interval was 95% study, allowable error was 5% and effect size was 0.43 [13]. After calculation the sample size

by the G-Power version program, the total sample size was used 35 participants to select with the study.

B. Material and Procedure

This research was conducted to study the used herbal joss strick by using Saabseua and community participation to reduce the incidence rate of dengue fever in the suburban area of Thailand. This is one group design to measure the pre-post of outcome change of before and after the 2-week trial. The study area was implemented at KhlongHok Subdistrict, Khlong Luang District, Pathumthani Province. This area had the high incidence rate of dengue fever and increased in every year [8] and this area is the suburban area and the majority of the area had deserted area and refuse disposal which there is the *Aedes* mosquito breeding grounds. This intervention was separated into 2 stage includes; the experiment stage, this stage was designed to the experimental study for exploring the effective of the optimal formula of Herbal Joss Strick before implementation and the implemental stage; this stage was designed to actualize in the study area. This intervention program was developed base on the epidemiology triangle of the diseases [11]. The triad consists of an external agent, a susceptible host, and an environment. The step of the intervention program can describe as follows:



Figure 1. Kaffir lime rind



Figure 2. Saabseua leaf



Figure 3. The herbal joss stick characteristic by Siam weed and Kaffir lime rind

1.) *Experimental stage*; This stage was aimed to rummage the optimal formula of herbal joss strick before implement in the community. The researchers were started to review the previous study which related to the study for developing the formula. Conclusion, the researchers were selected the kaffir lime rind and Siam weed or Saabseua leaf to make the herbal joss strick.

This program was developed with 2 formula of herbal joss strick (Formula I; Siam weed or Saabseua and Formula II; Kaffir lime rind). The ingredient of herbal joss stick consisted of 1.) Saabseua leaf 1 kg, 2.) Kaffir lime rind 1kg3.) Sawdust

1 kg, 4.) 2 knives, 5.) 1 blender machine, 6.) 2 baskets, 7.) beaker 1 set, 8.) Tapioca flour 1 kg and 9.) Meatball skewers.

The method to conduct the herbal joss strick can describe as follows; 1.) Take the prepared herbs in the sun to dry completely, 2.) Take each type of dried herbs and spin them to make them finer Take each type of dried herbs and spin them to make them finer, 3.) The sawdust is blended thoroughly, 4.) Mixed each herb and Tapioca flour by using water to make the mixture homogeneous, 5.) After that, use the herbs mix with Tapioca flour to form on the meatball skewers, and, 6.) After that, put the incense in the sun to dry.

The researcher was conducted the experiment to test the effective of herbal joss strick to repellent the *Aedes aegypti* in the laboratory room in the hospital. This experiment was used the mosquito net, there were 35 mosquitoes per mosquito net. The result showed that after 30 minutes, an *Aedes aegypti* mosquitoes were 100% repelled by using Saabseua leaf herbal incense and 80% repelled by using Kaffir lime rind herbal incense.

2.) *Implementation stage*; This stage was aimed to appraise the effect of the intervention program before and after 2-week. This study was measured on 2-weeks before implementation which based on the incubation period of dengue fever (5-8 days). The researcher was started with review the morbidity and mortality rate of dengue fever, the characteristic of *aedes aegypti* and type of pathogen from the medical record of Khlong Luang Hospital. After finishing the reviews step, the researchers were analyzed the health profiles and raise to consider from community forum. The stakeholders were selected to join with the community forum for criticizing of the appropriately of the intervention program with combination by the community participation. After the researcher were received the community need and choose the optimal formula of herbal joss strick found that Siam weed or Saabseua is effective more than kaffir lime rind. The intervention program can separate into 3 modules and described as follows;

Module I; Provide the heath education about dengue fever.

Module II; Provide the attitude for preventing the dengue fever activity by using the role play and VDO motivation.

Module III; Organize a campaign to eliminate *Aedes aegypti* larvae by engaging the community participation.

Module IV; Promote to use the herbal joss strick by using Saabseua leaf to repellent the *Aedes aegypti* in their house when they were stayed in daytime. herbal joss strick can use for 30 minutes per piece.

For data collection, this study was ordered the process of data collection as follows; 1.) Survey community profile of Moo 6 communities, KlongLuang district, PathumThani Province, Thailand 2.) Interpretation the data and analyze for exploring the community characteristics. 3.) Developing the community forum for sharing and discussing with the implementation for prevention and control the dengue fever in the community from the stakeholder. 4.) After the researcher was get the data from the community need, the researchers were brought to develop the herbal joss strick by using Saabseua and other intervention process 5.) The researchers were used the pilot study to assess the effect of herbal joss

strick by using Saabseua in the laboratory room of the KlongLuang hospital and consulting with the traditional medicine provider in the hospital and reform the proportion of the ingredient to make the effective herbal joss stick to repellent the *Aedes Aegypti* 6.) the researcher was proposed the intervention protocol to the hospital director, supervisor and head of the community to understand the concept of the intervention program and allowed to conduct the intervention program 7.) After the study protocol was approached by the supervisors, the researchers were implemented the intervention program in the community with 2-weeks of intervention time frame 8.) When the intervention finished, the researchers were measured the outcome followed by data collection planning, analyzing and interpreting the effectiveness of the Herbal Joss Strick by using Saabseua and community participation to reduce the incidence rate of dengue fever in the suburban community.

C. Instruments

This program was used the observational structural form and assessment form to measure the outcomes. The social distancing, mask cover and washing hand were considered to prevent the Coronavirus-19 distribution when conducting the intervention program. The program was measured the validity by peer from 3 experts on health behavior and reported the IOC value. The IOC value was ranged between 0.5-1.0. The reliability was tested in 30 participants in the same district with the study area whose characteristics were similar to those of the participants. The reliability of Cronbach's alpha coefficients was more than 0.90, it was acceptable of tool. The detail of the instrument can describe as follows:

Part I: The baseline characteristics questionnaire and medical record form: The total of this part was 9 questions. This part was to record the general characteristics, health data and economic data such as gender, age, household number, marital status, educational level, occupational, monthly income, health problem and drug intake. The medical record form was used to record the incidence rate of dengue fever in 2-week.

Part II: The knowledge of dengue fever assessment form; The total of this part was 10 questions. Each question has 4 choices. The score ranged from 0-10 points. The high total scores indicated high level of knowledge about dengue fever.

Part III: The attitude with the dengue fever; This part was used to assess the attitude with the dengue fever. The total of this part was 10 questions. The score ranged from 10-30 points. The high total scores indicated high level of attitude with the dengue fever

Part IV: The House index of Larva indicator; The vector surveillance is required to sustain the control measures and detect any increase in vector density. The most used indicators for vector surveillance are the House index (HI): percentage of houses infested with larvae and/or pupae.

D. Ethical Consideration

This study was approved by the Ethics Review Committee for Research Involving Human Research Subjects. The researcher and co-research were informed the participants

about the study protocol and the risk of the intervention program before they signed a written consent form.

E. Statistical analysis

The Shapiro–Wilk test was used to measure the normality test. The Chi-square test and Pearson’s correlation coefficients were used to estimate baseline characteristics between groups. The results showed that there was the normal distribution in all variables. This study was to compare all of the parameters before and after 2-weeks intervention program. Thus, the paired sample t-test was used to compare before and after 1-month intervention program between the group and within the group, respectively. All results were considered statistically significant at 0.05.

III. RESULT

A total of 35 participants in the total who participated in this study and who were finished the post measurement at 2-weeks. The comparison of the parameters within the intervention group at the baseline and 2-weeks intervention program found that the knowledge about dengue fever was at 6.60 ± 1.828 and increased significantly to 8.80 ± 0.932 ($p < 0.001$). The attitude about dengue fever was at 2.68 ± 2.143 and increased significantly to 2.94 ± 1.679 ($p < 0.001$). When considering the incidence of dengue fever, the result showed that there was 138.17 per 100,000 population in January, 2021 and decreased to 0.00 per 100,000 population after 2-week measured. Moreover, the house index of larva indicators was at 50% and decreased to 0% after 2-weeks measured.

TABLE I. The results of all outcome before and after 2-weeks intervention program (n=35).

Variable	Baseline (Mean± SD.)	2-weeks Intervention (Mean± SD.)	p-value
Knowledge of dengue fever	6.60± 1.828	8.80± 0.932	<0.001*
Attitude of dengue fever	2.68± 2.143	2.94± 1.679	<0.001*
Incidence rate of dengue fever	138.17 per 100,000 pop	0.0 per 100,000 pop	-
House index of larva indicator	50% of HI	0% of HI	-

REMARK: Data were analyzed with paired sample t-test within group.
*Statistically significant at the 0.05 level p-value<0.05.

IV. DISCUSSION

The study design was pre-post of Quasi-experimental study and designed to measure at the baseline and 2-weeks intervention program. Which appropriated for measuring the of intervention program. The comparison within the group found that the knowledge and attitude of dengue fever were increased after 2-week of intervention program ($p < 0.001$). The intervention program can reduce the incidence rate of dengue fever, the result showed that there was 138.17 per 100,000 population at the baseline and decreased to 0.0 per 100,000 population or did not found the case of dengue fever in the study area. Moreover, the intervention and reduce the house index of larva indicators, after the intervention finished, there was 0% of HI in this study.

The result is consistent with the study of MSN. Ranasinghe, L. Arambewela, S. Samarasinghe [10] whose study the development of herbal mosquito repellent. The results showed that aafter analyzing the mosquito repellent activity of individual extracts and essential oils, a mosquito repellent gel and a mosquito repellent spray which contained 16% (V/V%) active ingredients each were prepared. Outdoor and indoor field trials were conducted in two days from 5 am to 11 am by separately applying the mosquito repellent gel and the mosquito repellent spray on volunteers’ legs. The gel and the spray showed 100% mosquito repellency for outdoor and indoor field trials which were carried out for six hours each day for two days. Similarly with R. Teerapong, P.Tanida [9] whose study the community participation of dengue hemorrhagic fever prevention by applying social marketing theory in municipality district. This research study was conducted with the objective of developing the participation of the community in the prevention and control of dengue hemorrhagic fever. The results showed that the development of community participation in prevention and control of dengue fever, the sample had an average score in terms of awareness and participation in the implementation of activities to prevent and control the disease in the community. It was higher than before the development of statistical significance ($p < .05$) and the index of the prevalence of mosquito larvae in homes fell 50 percent after conducted the research. Moreover, the result consistent with P. Silalai [14] whose the participation of the community in the development of the cattail mosquito repellent to promote the community business. The results of this research were revealed that the efficiency of cattail mosquito repellent can last for over 3 months with no change of the samples. The combustion efficiency with the above size took 90 minutes to the complete burning. The preventive efficiency in the 5-minute use of mosquito repellent was that the mosquitoes disappeared. There were no mosquitoes around the tested area after the 15-minute use. The advantage of this product was not harmful to health and the users satisfied with the results.

The results may be explained that firstly, this intervention program was established by the epidemiology triangle which the main factors consisted of host, agent, and environment. This intervention was separated into 4 modules as follows; 1.) Module I; provide the heath education about dengue fever. This module was aimed to solve with the host factor. 2.) Module II; Provide the attitude for preventing the dengue fever activity. 3.) Module III; Organize a campaign to eliminate Aedes aegypti larvae by engaging the community participation. This module was aimed to solve with the environmental factor. 4.) Module IV; Promote to use the herbal joss strick by using Saabseua leaf to repellent the Aedes aegypti. This module was aimed to solve with the agent factor. As following the detail of intervention modules can reduce the incidence rate of dengue fever and the house index of larva indicator. Secondly, this herbal incense was used the local herbal to develop the innovation to repellent the Aedes aegypti. Saabseua (Eupatorium odorata) is a weed that has many biological activities. The previous study was reported that the extraction of Saabseua can repellent against Aedes

aegypti [15]. The result consisted with A.D. Reegan, et al. [16] whose study larvicidal activity of medicinal plant extracts against *Culex quinquefasciatus* Say and *Aedes aegypti* L. mosquitoes (Diptera: Culicidae). The result showed that this herbal is effective to repellent the *Aedes aegypti*. Moreover, X.C. Liu, Z.L. Liu [17] whose study the evaluation of larvicidal activity of the essential oil of *Ageratum conyzoides* L. aerial parts and its major constituents against *Aedes albopictus*. The present findings indicated that the essential oil of *A. conyzoides* aerial parts and two major constituents have potential for use in control of *Ae. albopictus* larvae and could be useful in search of newer, safer and more effective natural compounds as larvicides. The innovation can develop to the OTOP product in the community that it can improve the income status of participant in the community. Thirdly, this program was focused on the community participation which is effective to solve the dengue fever in the community. Moreover, the researchers were assessed the satisfaction of herbal incense innovation in this study, it was found that they mostly had high level of satisfaction (71.4%) followed by the moderate and low level of satisfaction (28.6% and 10.0%, respectively).

V. LIMITATION AND RECOMMENDATIONS

There were 3 limitation in this study. Firstly, the intervention was conducted 2-weeks. The study had short duration; the future study should apply this program to longer measured to compare the outcome. Secondly, this study was used one-group designed which there is the internal comparison. The future study should design to 2 group design; intervention group will receive the herbal joss strick and the control group will receive the standard treatment or self-control handbook, it can assess the validity and effect of the intervention program, because it has the comparison group. Thirdly, the results of this study cannot generalize to the urban area or the rural area duo to differences in lifestyles, socio-demographic, economic status and other characteristics.

VI. CONCLUSION

This research was to measure the effects of herbal joss strick and community participation to reduce the incidence rate of dengue fever in suburban area of Thailand. The result showed that the intervention program can reduce the incidence rate of dengue fever and HI of larva indicator. Moreover, the intervention program can improve the knowledge and attitude of dengue fever. This study shows that the epidemiology triangle is effective to reduce the incidence rate of dengue fever. This program was designed by focusing with host, agent and environment factors and showed in the intervention modules. For future study should ferment the herbal with the 95% ethanol, because the 95% ethanol can maintain the effect from herbal extract as resulting to repellent the *Aedes Aegypti*. Therefore, the development of community participation is effective for preventing and control of dengue fever. The future study must integrate the community participation to reduce the incidence rate of the disease.

ACKNOWLEDGMENT

The authors are grateful to all participants for their willing participation in this study. We would like to give a special thanks to the Directors of KlongLuang hospital and head of Klonghok, sub-district for the generosity location to conduct the program. This intervention program is a part of the Co-operative in Public Health Academic years 2020 by collaborating with KlongLuang Hospital.

REFERENCES

- [1] Bureau of Epidemiology, Department of Disease Control Ministry of Public Health. "Prediction of disease and health hazard surveillance in Thailand, 2016", *Weekly Epidemiological Surveillance Report*, vol 47, issue 1, pp. 1-8, 2016.
- [2] K. panyathorn. "The Effectiveness of Community Participation in Preventing and Controlling Dengue Hemorrhagic Fever at Chieangpin village, Chieangpin Sub-District, Mueang District, Udonthani", *Journal of Nursing and Health Care*, vol 39, issue 3, pp.147-156, 2020.
- [3] Department of disease control. *Dengue Hemorrhagic fever prediction report*, 2019 Available from: <https://ddc.moph.go.th/uploads/>
- [4] A. Forsyth, Ann. "Defining Suburbs" *Journal of Planning Literature*, vol 27, pp. 270-281, 2012.
- [5] Sylvia J.T. Jansen. "Urban, suburban or rural? Understanding preferences for the residential environment", *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, vol 13, issue 2, pp. 213-235, 2020.
- [6] S. Batarra, H. Saleh, H. Ariyanto. "Transformation of metropolitan suburban area (a study on new town development in Moncongloe-Pattalassang Metropolitan Maminasata)", *Earth and Environmental Science*, vol 202, issue 1, 2018.
- [7] P. Ann, A. Georges, L.Piet. "Urban and suburban lifestyles and residential preferences in a highly urbanized society", *Belgeo*, pp. 1-2, 2012.
- [8] KlongLuang Hospital. *The incidence rate of dengue fever in KlongLuang District, PathumThaini Prvince, Thailand*, 2020.
- [9] R. Teerapong, P.Tanida. "Community Participation of Dengue Hemorrhagic Fever Prevention by Applying Social Marketing Theory in Municipality District, Wichianburi Phetchabun Province", *KKU Research Journal (Graduate Studies)*, vol.18, issue 4, pp. 102-114, 2018.
- [10] MSN. Ranasinghe, L. Arambewela, S. Samarasinghe. "Development of Herbal Mosquito Repellent Formulations", *International Journal of Collaborative Research on Internal Medicine & Public Health*, vol 8, issue 6, pp. 341-379, 2016.
- [11] KJ. Rothman, "Causes", *Am J Epidemiol*, vol 104, issue 6, pp. 587-592, 1976.
- [12] Bureau of Vector Borne Disease. *Annual report of dengue fever*, 2018 Available from: <https://ddc.moph.go.th/uploads/ckeditor/6f4922f45568161a8cdf>.
- [13] N. Mukarromah, R. Hargono, S. Keman. "The Social Capital Approach to improve the community sustainability awareness in prevention of dengue hemorrhagic fever", *Int J Sci Res*, vol 2, issue 10, pp. 74-77, 2015.
- [14] P. Silalai, "The Participation of the Community in the Development of the Cattail Mosquito Repellent to Promote the Community Business", *Rajabhat RamBhai Barni Research Journal*, vol 9, issue 2, pp. 107-113, 2015.
- [15] H. Srisuda, et al. "Larvicidal and Repellent Activities of Crude Extracts and Essential Oils from *Eupatorium odorata* Against *Aedes aegypti*, *Culex quinquefasciatus* and *Anopheles dirus B*", *Res. J.*, vol. 10, issue 3, pp.130-157, 2017.
- [16] A.D. Reegan, et al. "Larvicidal activity of medicinal plant extracts against *Culex quinquefasciatus* Say and *Aedes aegypti* L. mosquitoes (Diptera: Culicidae)", *International Journal of Pure and Applied Zoology*, vol 2, issue 2, pp. 205-210, 2015.
- [17] X.C. Liu, Z.L. Liu. "Evaluation of larvicidal activity of the essential oil of *Ageratum conyzoides* L. aerial parts and its major constituents against *Aedes albopictus*", *Journal of Entomology and Zoology Studies*, vol 2, issue 4, pp. 345-350, 2014.