INTERNATIONAL MULTIDISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
SJIF 2019: 5.222 2020: 5.552 2021: 5.637 2022:5.479 2023:6.563 2024: 7,805
eISSN :2394-6334 https://www.ijmrd.in/index.php/imjrd Volume 11, issue 07 (2024)

UDC: 632.95.087.3 632.

INFLUENCE OF COLOR CHANGES IN LIGHT TRAPS ON THE NUMBER OF INSECTS

Eshpulatov Nodir Mamatkurbonovich - associate professor, PhD.
Nig'matov Azizjon Makhkamovich – senior lecturer.
"TIIAME" National Research University

ABSTRACT: Insects are the most common types of pests that attack fruit plants. The pest attacks fruits on the plantation. Insect control is quite difficult and is usually done with eugenol. Fruit flies are insects that are sensitive to light with a wavelength of 300–650 nm. Light trapping is a commonly used method, but is rarely used to control fruit flies. This study was conducted to determine the effect of changing the color of light traps on the number of fruit flies caught. This study used quasi-experimental research methods. Data were analyzed descriptively and continued with one-way ANOVA statistical testing using SPSS 25.0. The results showed that the light traps supplemented with blue light had the highest average number of fruit flies, 17.22. Subsequent tests showed that blue light was more effective at attracting flies to the light traps.
Key words: Blue light lamp, fruit gnats, light trap, pest control, wavelength, voltage, efficiency, insects.

Introduction. Fruit and vegetable products have great prospects for development as they have high economic value, even the market demand for these products covers domestic and foreign markets. The price of imported fruits and vegetables is higher than that of local varieties.
This allows local varieties of fruits and vegetables to compete in the market. However, the quality of fruits and vegetables must be taken into account so that the opportunities can be effectively realized. The low quality of local fruits and vegetables is associated with the attack of fruit fly pests [1]. This type of fly is one of the main pests of horticultural crops, especially fruits. More than 100 species of fruit plants are targeted by fruit flies. In large populations, the intensity of attacks reaches 100%. The attack of fruit fly pests leads to significant losses, reaching 30-60%. Infection of old fruits leads to wet rot due to attack by larvae. Fruit fly attack will increase in cool climates with high humidity and moderate winds. Fruit fly attacks are on the rise and the need for control methods, especially the development of effective, efficient and environmentally friendly control methods, is highly anticipated. Fruit fly control is difficult despite many efforts made, including mechanical, technical and biological methods.
Fruit flies are one of the pests belonging to the class of insects. One of the characteristics of insects is their interest in light. Fruit flies prefer dim light compared to dark places [2]. The use of light as an insect trap has been traditionally used for a long time, such as the use of a Petromax lamp to trap larvae (insects), the use of bright colors to trap fruit flies and flies, and the use of ultraviolet light. catch mosquitoes.
Light traps are one of the most common methods of catching insects. Although light traps are commonly referred to as "CDC light traps", various models of light traps have been developed, equipped with incandescent or UV lamps. Recently, light traps have been modified by replacing incandescent light bulbs with light emitting diodes (LEDs) [3]. Various species of insects, including fruit flies, can respond to light with wavelengths of 300–650 nm, from the ultraviolet to red color spectrum.
The wavelengths that can be perceived by insects vary due to differences in the retinal cells of the insects' eyes. Flies can also sense ultraviolet frequencies in the light spectrum that are invisible to

humans. Based on various experiments, it can be proven that insects are able to recognize and differentiate between different types of flowers. Insects see ultraviolet light clearly. In general, insects have two peaks of sensitivity, namely blue-green color. This is also supported by previous studies using a light trap with five light emitting diodes (LEDs) (white, green, red, blue and ultraviolet) operating for 15 consecutive nights.

The results showed that more were caught in traps with green, blue or ultraviolet (UV) light compared to traps with red and white LEDs. The differences in the results of these studies lead to the need to conduct light trap studies with lamps of different colors.

Fruit flies attack not only plantations, but also fresh fruits in markets. Many fruit sellers complain that there are fruit flies in the area where they sell fruit.

This is because one fruit fly can attack other fruits, especially papaya and sapodilla fruits, since the fruits do not need to be peeled before they can attract fruit flies. Thus, there is a need for an alternative method of fruit fly control that is simple and affordable. However, further research is still needed. The use of light traps can also be used as an alternative to fruit fly pest control. Several previous studies that used the light trap method to catch flies reported that flies were also caught in yellow light and the number of flies captured was higher in red light traps. Meanwhile, research has shown that flies are trapped by blue light.

Physico-mechanical and physiological control of flies is also usually carried out using adhesives and stick traps of various colors. In this study, control was achieved by installing fly glue by adding TL lamps (tubular lamps) to the traps with color variations depending on the wavelength preferred by the flies. The purpose of this study was to determine the effect of light color on a simple light trap and to find the most effective light to use in this trap. The light trap is expected to attract fruit flies to the roost because flies are very attracted to light.

Research method. This study is a quasi-experimental study using a post-test design with a control group design. In this study, the entire population in the sampling area consisted of fruit flies. Setting traps in the field. A simple light trap was designed and constructed from five plastic boxes consisting of four light trap boxes with TL lamps as the treatment group and one box without lamps as the control. The TL lights were then installed, fly glue was added to the box, and fruit was placed inside in equal amounts.

The light trap and control unit were placed in the same place at the same temperature and humidity, and the TL lamp (tubular lamp) was connected to the socket. The exposure was carried out for 8 hours, starting at 21:30, with 9 repetitions in both the control and main groups. Captured fruit flies were counted directly. Fruit flies are 3-4mm in size, have a brownish-yellow body (some are grey) and a red eye. The samples in this study were fruit flies caught in light traps. The independent variable in this study was the color of the lamp and the dependent variable was the number of fruit flies caught. This study was related to the method of a previous study conducted by [4], in which researchers created different colors of light in fly and mosquito traps in the home. The simple light trap developed by the researchers in this study is shown in Figure 2.

Data Analysis. The data obtained were grouped into tables, then analyzed descriptively and followed up with statistical tests using SPSS version 25.0. Statistical testing began with testing the normality of the data using the Kolmogorov-Smirnov test as an initial test. Normally distributed data were then statistically tested using one-way analysis of variance (5%). To determine the most effective color of light for catching flies, a post hoc test was conducted with a significance level of 5%.

Results. Data acquisition was carried out 9 times and showed that light traps with blue light had a higher number of fruit flies captured compared to light traps with red, green and white light. An average of 17 fruit flies were caught in the blue light trap. The smallest number of caught fruit flies was found in light traps without TL lamps (control), with an average of 5 (Table 1).

Data in Table 1 were tested for normality using SPSS 25.0 and then further analyzed using one-way analysis of variance. Data normality was checked using the Kolmogorov-Smirnov test. The results of normality tests show that the data has $p = 0.200$ ($p > 0.05$), so we can conclude that the data on the number of fruit flies caught in the light trap, both in the treatment and in the control group, is normally distributed . One-way analysis of variance was performed to determine differences in the variance of each factor. Factors in this study were the color variations of the lamps used in the light trap. A statistical test with one-way ANOVA showed that the average number of flies caught in the control light trap (no light) was 4.89, while the average number of flies caught in the green, blue, red and white light trap was 4.89. was 8.44. 17.22, 11.22 and 9.67, respectively.

Table 1. Number of fruit flies in each light trap

Repetition	Control procedures				
	No lamp	Green lamp	Blue lamp	Red lamp	White lamp
1	0	6	11	8	3
2	7	6	12	7	5
3	4	4	16	10	2
4	5	7	12	3	8
5	9	8	13	11	10
6	7	10	20	8	5
7	4	11	25	17	19
8	5	13	23	19	18
9	3	11	23	18	17
Average	5	8	17	11	10
Difference		3	12	6	5

Based on the test results obtained descriptively, it can be concluded that the highest average number of fruit flies captured was in the blue light traps, which was 17.22. The ANOVA result also showed a significant difference in the mean number of fruit flies based on the color change of the light traps, so additional tests were conducted (post-hoc test).

According to the homogeneity test, the Games-Howell test was used as a post hoc test because the variance of the data was not homogeneous. The Games Howell test was conducted to identify treatments that produce significantly different effects. The results showed that in the control group (no light), the number of fruit flies caught was significantly different from the blue light group [4]. Meanwhile, the control group showed no significant difference in the number of fruit flies caught compared to green, red and white light. These results indicate that blue light is more effective in attracting flies to the light trap. Fruit flies caught in a simple light trap were calculated based on the general characteristics of fruit flies. Morphological characteristics of fruit flies: brown-yellow-gray body with thin and flat wings, abdomen with black stripes, size 3-4 mm. There were certain types with red eyes [4]. The mean number of fruit flies caught, provided by descriptive data, showed that the control group was the group with the lowest mean number of fruit flies caught compared to the treatment group (Light Variation Trap (Fig. 1).

This is because the fly is a phototrophic insect, which means that the insect is attracted to the color of light, which is why fruit flies like light areas over dark areas [5]. The symptoms that occur because an object reflects light and is of the nature of light and has different wavelengths are called colors.

Figure 1. Simple light trap (control and treatment).

The colors used in this study ranged from 300 to 650 nm and consisted of red, green and blue. This study also used the color white, although this color is not in the 300–650 nm wavelength range since it is an object that can reflect all light. Light traps with blue light produced the highest average number of flies captured. The wavelength of blue light is in the range of 450-495 nm.

These results are supported by previous studies, which stated that the highest number of flies caught was found under blue light. The sensitivity range of flies' eyes is 300-650 nm. Blue has a shorter wavelength than red and green. The light trap with the second highest number of flies caught was the red one.

According to previous research, red is part of the wavelength range that can attract insects, ranging from ultraviolet to red. This is also supported by Munandar's research. Hastingsih and Kusariana reported that most flies were attracted to the color red.

Light traps with green light were the least effective at catching fruit flies among flowers in the 300-650 nm wavelength range. This happened because green light cannot emit ultraviolet light. Even with green light, fewer fruit flies were caught compared to white light.

This is in line with a study by Munandar and Wulandari, Bey & Tindaon, who showed that flies are still attracted to the color of white light. Light traps without the addition of birds had the lowest results in catching fruit flies. This fact shows that adding light colors to a light trap increases the number of fruit flies caught. The control sample was still visited by flies, even though it did not reflect light at all. Further studies of the effects of ultraviolet light showed that traps with UV lamps caught more house flies than traps without UV lamps and open-type traps.

The use of light to control fruit flies is based on the physiological aspects of the insects. There are many species of insects that can detect aphrodisiacs in low doses. In fruit flies, a commonly used aphrodisiac is eugenol. However, the use of light traps, particularly for catching fruit flies, is even less optimal. Insects are highly sensitive to stimulation of smell, hearing and vision.

Flies are usually attracted to light due to their sensitive vision. The lamp used in the study emits light adapted to the sensitivity of the visual organs of fruit flies and insects in general, namely in the light spectrum range of 300-650 nm or in the violet, blue and green range. until red. The results of the post hoc test showed that the blue light trap was most effective in capturing fruit flies.

According to the results of Prasetya's study [5], the sticky glue trap with blue light had the highest number of fruit flies caught at 14.67. Meanwhile, in this study, the percentage of fruit flies caught was 16% for green light, 33% for blue light, 22% for red light, 19% for white light, and 10% for control groups (Figure 2).

Based on these results, it can be concluded that blue light is the most effective color for attracting fruit flies. The results of this study also support the reasons why many insect traps on the market

have a bluish light. Some difficulties in this study were the control of fruit, glue thickness, box color, and glue odor.

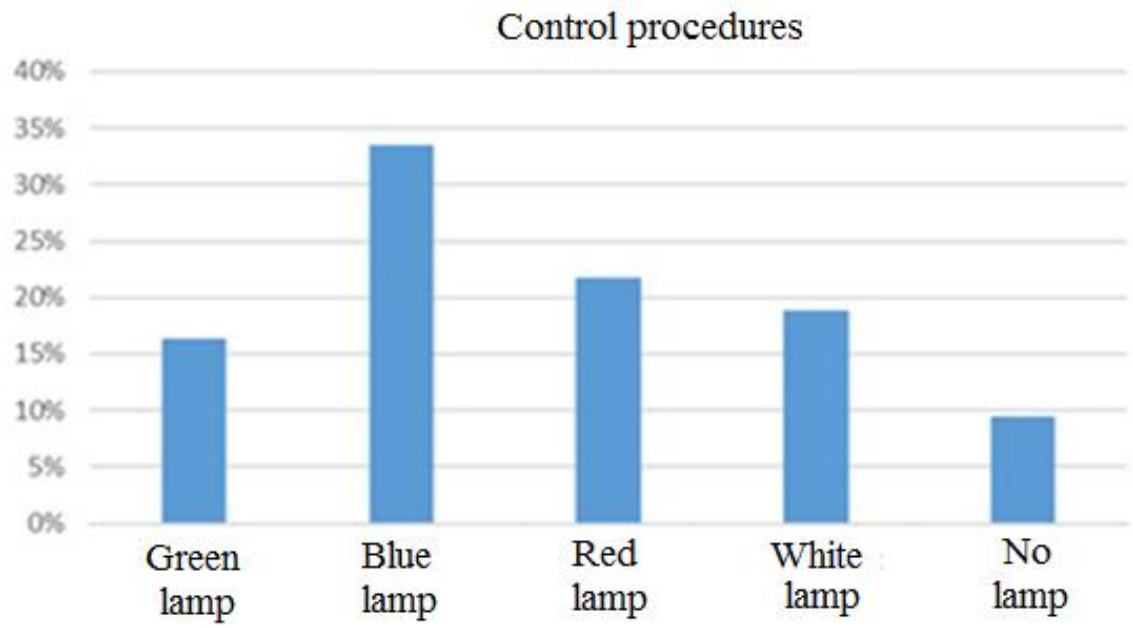

Figure 2. Percentage of fruit fly abundance (treatment and control)

An instant sticky glue trap was used which was applied to a paper sheet because if using a manual glue trap it would be difficult to measure the thickness of each sticky glue trap. The instant glue has the same smell as durian and the white is used to control the color of the box. The simple light traps developed in this study were able to help the public, especially fruit sellers, to control fruit flies landing on the fruit they sell and maintain the quality of the fruit.

Conclusion. Variations in green, blue, red and bright light influenced the number of fruit flies caught. The most effective lamp color that could be used in light traps was blue. Difficulties in this study included controlling fruit, glue thickness, box color, and glue odor. Simple light traps can be used as an alternative for the public, especially fruit sellers, to control fruit flies on fruit.

References:

1. Gaglio, G., Napoli, E., Falsone, L., Giannetto, S., & Brianti, E. (2017). Field evaluation of a new light trap for phlebotomine mosquitoes. Acta Tropica, 174, 114–117. https://doi.org/10.1016/j. actatropica.2017.07.011

2. Gaglio, G., Napoli, E., Arfuso, F., Abbate, J. M., Giannetto, S., and Brianti, E. (2018). Do different LED colors affect the collection of sand flies by light traps in the Mediterranean? BioMed Research International, 2018, 7. https://doi.org/10.1155/2018/6432637.

3. Gonzalez, M., Alarcón-Elbal, P. M., Valle-Mora, J., & Goldarazena, A. (2016). Comparison of different light sources for catching Culicoides midges, mosquitoes and other dipterans. Veterinary Parasitology, 226, 44–49. https://doi.org/10.1016/j. vetpar.06.20.2016

4. Muller, G.K., Revai, E.E., and Beyer, J.K. (2011). Simplified and improved traps for monitoring sand flies. Journal of Vector Ecology, 36(2), 454–457. https://doi.org/10.1111/j.1948-7134.2011.00188.x

5. Muryati, Hasim A. and de Kogel W. (2007). The species Lalat buah di Sumatera Barat dan Riau are distributed. Journal of Horticulture, 17(1), 61–68. https://doi.org/10.21082/jhort.v17n1.2007.p